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**CATÁLOGO DE ESPECTROS DINÂMICOS DE EXPLOSÕES
SOLARES DECIMÉTRICAS REGISTRADAS PELO
BRAZILIAN SOLAR SPECTROSCOPE (BSS): 2001**

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SUMÁRIO

	Pág.
1 - O PROJETO BRAZILIAN SOLAR SPECTROSCOPE (BSS)	1
1.1 - Breve Histórico	1
1.2 - Descrição Geral do Instrumento	1
1.3 - Visualização e Análise de Dados	1
2 - OBSERVAÇÕES SOLARES DECIMÉTRICAS: 2001	3
3 - CATÁLOGO DAS EXPLOSÕES SOLARES REGISTRADAS	9
REFERÊNCIAS BIBLIOGRÁFICAS	125

1 - O PROJETO BRAZILIAN SOLAR SPECTROSCOPE (BSS)

1.1 - Breve Histórico

Em 1990, a Linha de Pesquisa e Desenvolvimento de Física do Meio Interplanetário (FMI), da Divisão de Astrofísica, do INPE iniciou a primeira etapa do projeto de desenvolvimento do espectrógrafo solar. Inicialmente, foi instalado, em São José dos Campos, SP, um refletor parabólico de 9 metros de diâmetro, com um alimentador de banda estreita, operando no foco da antena na faixa de frequência de (1600 ± 100) MHz. A aquisição digital de dados teve início em 1992 (Sawant e Rosa, 1990; Sawant et al., 1991; Fernandes, 1992; Sawant et al., 1992; Sawant et al., 1993; Sawant et al., 1996). Este instrumento esteve em operação regular até o final de 1994, e registrou cerca de 350 grupos de explosões solares.

A partir de 1995, teve início a nova etapa do projeto, com a instalação de um alimentador de banda larga composto de duas antenas log-periódicas cruzadas e com a modificação de todo equipamento para operação na faixa de frequência de 200 a 2500 MHz, incluindo o software de aquisição. O espectrógrafo de banda larga entrou em operação em maio de 1996, com observações iniciais principalmente para testes do funcionamento do sistema, incluindo a aquisição digital dos dados e aquisição do código de tempo do GPS (“Global Position System”). Desde abril de 1998, está em operação regular, o instrumento batizado de **Brazilian Solar Spectroscope (BSS)** (Fernandes, 1997; Faria, 1999; Fernandes et al., 2000; Sawant et al., 2000; Sawant et al., 2001; Fernandes et al., 2001). O sistema de aquisição digital dos dados tem sido aprimorado, junto com o desenvolvimento dos programas para visualização e tratamento dos dados digitais (Faria, 1999; Martinon et al., 2000).

1.2 - Descrição Geral do Instrumento

O sistema receptor do BSS é constituído pela antena parabólica de 9 metros de diâmetro, do alimentador de banda larga (200 - 2500 MHz) composto por um par de antenas log-periódicas cruzadas, que permitem a recepção das componentes ortogonais (vertical e horizontal) do sinal recebido da fonte (Sol). A saída do alimentador está conectada a dois pré-amplificadores de baixo ruído, ligados a um circuito somador de banda larga. Depois de somado, o sinal é introduzido em um analisador de espectros (HP8559A), depois os sinais de variação de tensão na saída do analisador seguem para os sistemas de aquisição e monitoramento. O dados coletados pelo sistema receptor são digitalizados no microcomputador de aquisição e armazenados e visualizados num segundo microcomputador, conforme mostra a Figura 1. A Tabela 1 mostra as principais características do BSS.

O BSS é o único espectrógrafo dedicado às observações solares na faixa decimétrica, com alta resolução e alta sensibilidade em operação no hemisfério ocidental terrestre, de modo que, entre 16 e 19 UT, este é o único espectrógrafo digital a monitorar o Sol, preenchendo uma lacuna entre as observações realizadas na Europa e na América do Norte.

1.3 - Visualização e Análise de Dados

Para visualização e tratamento dos dados digitais do BSS é utilizado um programa desenvolvido na linguagem IDL (“Interactive Data Language”) batizado de BSSView (Faria, 1999). Este programa permite visualizar em tempo quase-real o espectro dinâmico das observações e obter representações gráficas dos dados digitalizados (perfis temporais de múltiplos canais de frequência, imagens 2D e 3D em escalas de cores e mapas de contorno).

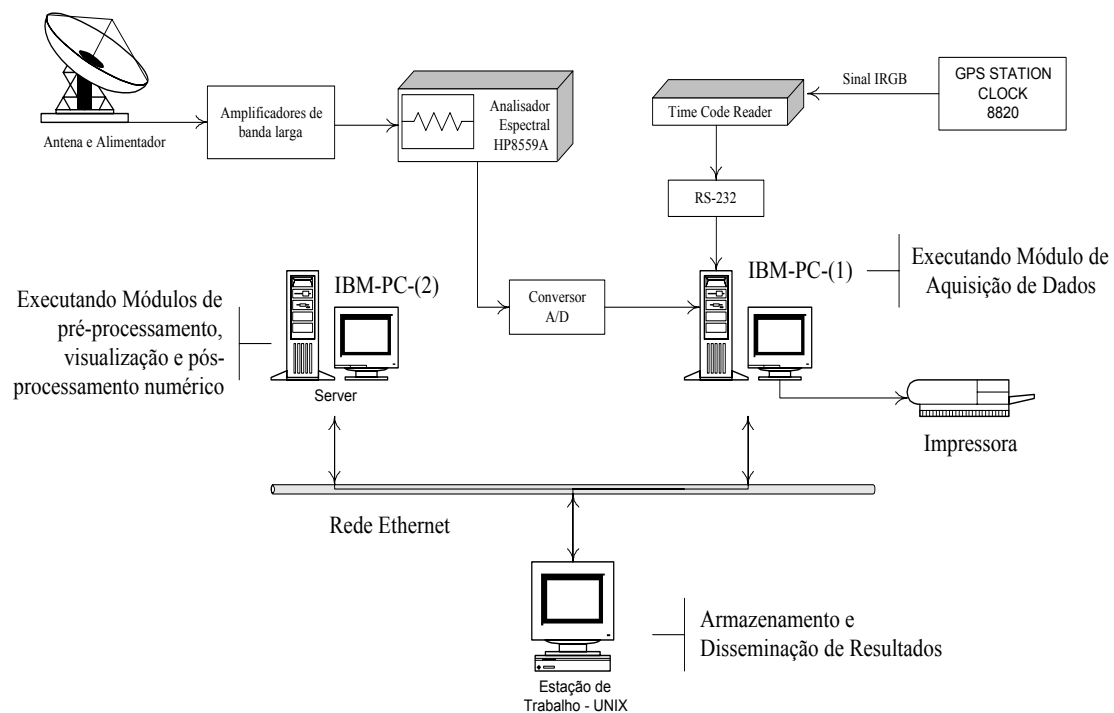


FIGURA 1 - Diagrama de blocos representando o Brazilian Solar Spectroscop (BSS).

TABELA 1 - Principais características do BSS.

Diâmetro da Antena	9 metros
Montagem	polar
Alimentador	log-periódico cruzado
Frequência	200-2500 MHz
Resolução temporal	0,01; 0,02; 0,05; 0,10; 0,20; 1 s
Resolução espectral	1; 3 MHz
Precisão tempo absoluta	0,003 s
Sensibilidade	~2-3 sfu
Número de canais	25; 50; 100
Visualização	tempo real
Campo de visada	todo o disco solar
Observações diárias	11:00-19:00 UT

Para a determinação de parâmetros das observações, foi desenvolvido um programa base, batizado de BSSData (Martinon et al., 2000; Martinon et al., 2002), contendo ferramentas para destacar as explosões, para determinar visualmente os parâmetros das explosões, para manipular as cores do espectro dinâmico e para organizar os dados em projetos distintos.

2 - OBSERVAÇÕES SOLARES DECIMÉTRICAS: 2001

Devido à grande incidência de tempestades elétricas no verão na região de São José dos Campos, SP, que podem danificar a eletrônica do sistema do BSS, e principalmente às férias coletivas dos funcionários do INPE, os meses de janeiro e fevereiro são escolhidos para manutenção e reparos mecânicos na antena e no sistema de rastreamento, não ocorrendo observações neste período. Assim, as observações solares sistemáticas utilizando o BSS ocorrem entre os meses de março e dezembro. As observações são realizadas diariamente, de segunda a sexta, aproximadamente das 8:30 às 15:30 horas, horário local (11:30 - 18:30 UT). A Tabela 2 mostra o resumo das observações realizadas pelo BSS em 2001 e a Figura 2 a distribuição mensal dos dias de observação e eventos registrados. A lista completa das explosões solares observadas é apresentada na Tabela 3.

TABELA 2 – Observações solares com o BSS em 2001.

Dias	Horas	“Flares” solares registrados
181	1133	179

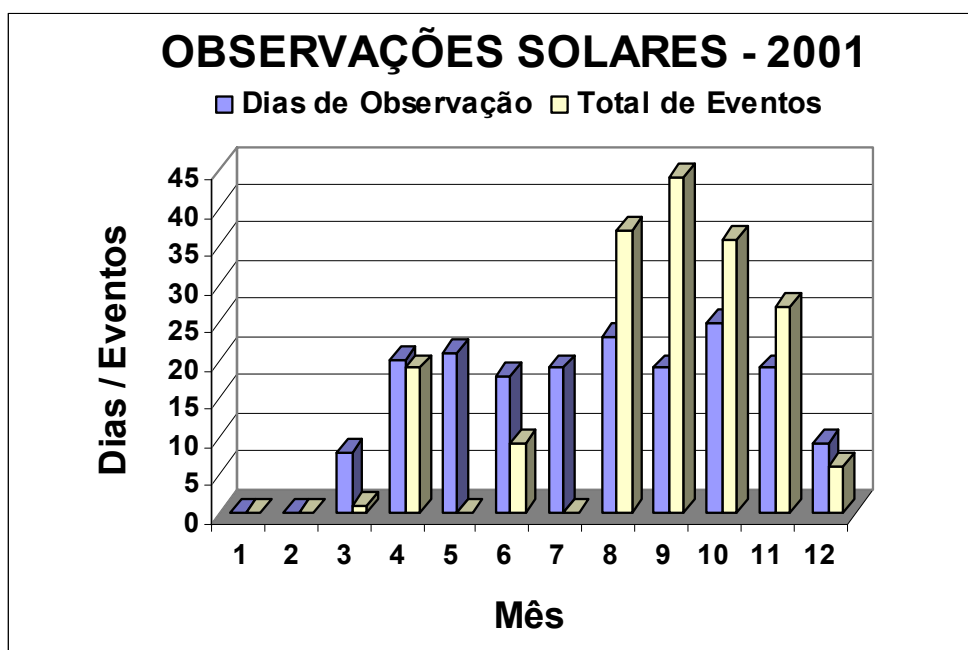


FIGURA 2 - Distribuição mensal do total de dias de observações solares realizadas pelo BSS em 2001 e do número de eventos registrados no mesmo período.

TABELA 3 - Lista de explosões registradas pelo BSS em 2001.

Dia	Hora (UT)	Tipo de atividade*	BSS Arq.	GOES	Atividade Associada**
MARÇO					
06	13:45:51:891	EF Fraca	A3	-	-
ABRIL					
04	12:14 – 12:15	EF VER fraca	A6-A7	M2.0	RBR 4995-15400
04	14:16 – 14:20	CNT + Puls.	C7-C8	-	-
05	13:09 - 13:10	fraca Puls. / Osc.	B6	-	LPS 10:05-17:12
05	16:53 – 17:21	CNT	F4-F8	M5.1	2N RBR 245-15400 RSP IV/1
06	17:18- 17:19	Puls.	F7	C5.0	SF
06	18:01 – 18:03	EF HOR fraca	G4-G5	C7.0	2F RBR 245-1415
09	15:20 – 16:05	CNT+Puls.+TIIIRS + spikes	C2-C9	M7.9	2B RBR 245-15400 RSP II/3 II/1 IV/1
11	13:55 – 14:07	CNT fraco	C1-C2	-	RBR 245-1415
11	17:23	EF nb	F6	-	SF
25	13:42 – 13:45	EF impuls + Osc.	C1	M2.7	2N RBR 245-15400 RSP II/2 III/2
25	13:55 – 13:56	Stria pq	C3	M2.7	2N RBR 245-15400 RSP II/2 III/2
25	13:59	EF normal dfdt	C4	M2.7	2N RBR 245-15400 RSP II/2 III/2
25	15:43 – 15:47	Osc. fraca	E2	-	-
25	15:53 – 16:04	Osc. fraca	E4-E5	C6.6	SF
25	16:40 - 16:43	Osc. fraca	F2	-	RBR 245
26	11:49 – 12:01	Osc. nb fraca	A0-A2	M7.8	2BRBR 245-15400 RSP CTM/1
26	12:36 – 12:41	Spikes	A8	M7.8	2BRBR 245-15400 RSP CTM/1
26	12:51 – 13:11	CNT + fiber + Osc.	B0-B3	-	RSP CTM/1 II/2 III/2 IV/2
26	16:06 – 16:35	Intens.var. fraca	E4-E8	-	SF
JUNHO					
01	12:56	EF nb Fraca	B4	-	RSP III/1
01	15:11 – 15:12	Patches nb	D7	-	SF
01	15:24	Int. var. fraca	E0	C1.4	RSP CTM/1
04	15:12 – 15:14	Int. var. fraca	C9	-	-
07	16:11 – 16:13	Stria nb + Int.var.	D8	C1.4	SF RSP V/2 III/2
13	11:35 – 11:42	CNT + Int. var. fraca	A0-A1	C2.5	1N RBR 245-15400 RSP II/3 CTM/2
13	16:22 – 16:25	Int. var. fraca	D9	C9.1	SF
13	16:29	EF nb fraca	E0	C9.1	SF
22	18:24 – 18:27	Int. var. +Puls./Osc.	F4-F5	C6.0	SN RBR 410-15400
AGOSTO					
02	15:00:01 - 15:00:29	TIII G	D4	C3.1	SF RBR 245-606 RSP III/3
02	16:54 – 16:58	EF fraca Puls.	F4	-	DSF
02	17:25 – 17:28	Fraco Ghost	F9-G0	-	SF RBR 245-606 RSP III/3
22	12:45:50–12:45:53	Patch fraco	A9	-	-
22	13:17	Int. var. fraca	B4	-	-
22	14:57:08 – 14:57:11	EF fraca	C7-C8	-	-
22	15:13:35 – 15:13:40	Patches + Int. var.	D0	-	SF
22	15:14:25	TIII ISO	D0	-	SF
22	15:14:35 – 15:14:40	TIII ISO	D0	-	SF
22	15:14:51 – 15:15:07	TIII ISO	D0	-	SF

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... Continuação

22	15:15:42– 15:15:43	TIII ISO	D0	-	SF
22	15:15:54– 15:15:55	Patches + Int. var.	D0	-	SF
22	15:16:04– 15:16:07	TIII ISO	D0	-	SF
22	15:39:58– 15:40:00	EF 2dfdt	D3	-	-
22	16:31:57– 16:31:58		E0	-	DSF
22	18:15 – 18:22	EF fraca	F2	C4.5	-
23	14:36:40 – 14:38:24	Inv. TIII-like	C5-C6	C3.3	SF RBR 410-1415
23	17:32	DOTS Chain	E8	-	-
24	13:04 – 13:05	DOTS HOR Chain	B2	-	-
24	13:25	EF Nclass	B4	C4.3	SF RSP III/1
27	16:53	Int var. fraca	D6	-	SF RSP III/2
28	13:41:38 – 13:41:42	EF RS (Bxfreq)	B7	C9.4	SF DSD
28	16:00 – 16:02	EF LATfreq fraca	D6	M1.1	SF RBR 245-15400 RSP II/3 IV/1
28	16:02:27 – 16:03:56	EF fraca	D7	M1.1	SF RBR 245-15400 RSP II/3 IV/1
28	16:10:04 – 16:10:50	Patch ISO + int.var.	D8	-	SF LOOP occultation
29	13:36	int.var. fraca	B6	-	-
29	14:19:51 – 14:20:07	Patch-like both dfdt	C2	-	RSP III/1
29	18:22:30 – 18:22:32	CNT rise + Puls. Rise - fall periodic	F5	C3.3	1F RBR 410-1415 RSP III/1 V/2
29	18:25:28 – 18:25:48		F6	C3.3	1F RBR 410-1415 RSP III/1 V/2
29	18:26:21 – 18:26:31		F6	C3.3	1F RBR 410-1415 RSP III/1 V/2
29	18:26:41 – 18:26:47		F6	C3.3	1F RBR 410-1415 RSP III/1 V/2
30	13:08:55 – 13:9:42	Patch-like p/ Atfreq	B3	-	RBR 245-410 RSP III/1
31	11:30 – 11:41	CNT+Puls. Interm.	A0-A1	C4.8	2RA 1F RBR 204-3000 RSP III/2 SF RBR 410-2695 RSP III/1
31	11:55:30 – 11:55:42	EF fraca LBxfreq	A3	-	-
31	12:15 – 12:16	Puls inte nb dfdt	A6	-	RSP III/1
31	14:56 – 14:57	Gradual	C6	-	-
31	15:29 – 15:32	CNT + Osc.	D2	C2.0	SF RBR 245-2695 RSP III/3 V/2

SETEMBRO

03	15:52	CNT fraco	D4	-	-
03	18:22 – 18:25	CNT fraco	F4-F5	-	-
05	11:50:54	Patch ISO tail	A3	-	-
05	14:27:45 – 14:28:58	Spikes Atfreq.	C4	M6.0	2B RBR 245-15400 RSP III/2
05	14:29 - 14:33	Puls. Chain Dots	C5	M6.0	2B RBR 245-15400 RSP III/2
10	16:38/16:39	Ghost fracos	E0	-	-
11	14:17:20 – 14:17:37	Chain Dots	C3	C3.2	SF DSF
13	13:03:52	TIII-like ISO	B3	C2.4	SF RBR 245-606 RSP III/2
13	13:04:20 – 13:04:30	TIII-like GG	B3	C2.4	SF RBR 245-606 RSP III/2
13	13:04:40	TIII ISO	B3	C2.4	SF RBR 245-606 RSP III/2
13	13:04:40 – 13:05:00	Puls./Osc.	B3	C2.4	SF RBR 245-606 RSP III/2
13	13:05:19 – 13:05:44	TIIIGG	B3	C2.4	SF RBR 245-606 RSP III/2
13	13:11	Puls.+EF LBxfreq	B4	C2.4	SF RBR245 RSP III/1
13	13:19:51 – 13:20:17	Periodic LBxfreq	B5	-	RBR 245 RSP III/1
13	14:00:47 – 14:00:51	Periodic LBxfreq	C1	-	-
13	14:38	EF ISSO fraca	C6	-	SF
13	14:45:35 – 14:45:22	CNT	C7	-	SF

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... Continuação

13	14:54:51 – 14:56:12	CNT	C8	-	-
13	14:56:14 – 15:03:32	CNT	C9	-	RBR 245-606 RSP III/3
13	16:00:23 – 16:02:12	CNT+cutoff Atfreq	D7	C7.0	SN RBR 245-15400 RSP III/1 II/1
13	16:02:19 – 16:02:48	RS ISO Puls.	D8	C7.0	SN RBR 245-15400 RSP III/1 II/1
13	16:06:31 – 16:06:33	RS ISO Puls.	D8	C7.0	SN RBR 245-15400 RSP III/1 II/1
13	16:06:42 – 16:07:33	RS ISO Puls.	D8	C7.0	SN RBR 245-15400 RSP III/1 II/1
13	16:08:15 – 16:08:23	RS ISO Puls.	D8	C7.0	SN RBR 245-15400 RSP III/1 II/1
14	13:04	TIII-like	B2	-	-
17	15:48:48 – 15:50:16	Cigar patch BT	D5	M8.1	1N RBR 1415-15400 RSP III/1
17	17:47:16 – 17:47:42	Cigarpatch BTAtfreq	F1	-	RSP III/1
18	12:34:32 – 12:34:59	EF RS fraca	A2	-	-
18	14:38:32 – 14:38:36	Patch ISO	B9	C6.9	-
18	15:11:26 – 15:11:47	TIII-like ISOBxfreq.	C4	-	-
18	15:11:55 – 15:12:58	Patch-split, U RS	C4	-	-
18	17:04:57 – 17:06:10	Patch, split, triple	D9	M1.4	SF RBR 606 4995
18	17:06:25 – 17:08:21	Split 2dfd + slow dfd CNT+ PDS	D9	M1.4	SF RBR 606 4995
20	11:29 – 11:35	CNT decay fraco	A2	-	RSP CTM/1
20	13:34 – 13:35	Zebra – chain Dots	B9	-	-
20	14:38 – 14:41	CNT Osc + fiber	C7-C8	C3.4	SF RBR 245-1415 RSP III/1
20	18:13 – 18:14	CNT var. + EF	F7	M1.5	SN RBR 245-15400 RSP III/1
24	11:22 – 11:44	CNT+Puls+ ISO Dot	A0-A2	-	RBR 245-15400
25	14:03 – 14:04	Patches fracos	C2	-	SF RBR 245-606
25	14:17 – 14:27	CNT int var	C4-C5	-	-
25	15:44 – 15:45	Int. var. fraca	D5	-	RBR 606 RSP V/2 III/2
25	17:12 – 17:15	Spikes + Puls. nb	E7-E8	C7.0	SF RBR 245-8800 RSP III/2
25	17:56	TIII (?) nb	F3	-	-
28	14:02 – 14:08	Int var fraca	C1	-	SF RBR 245 RSP III/2

OUTUBRO

01	13:33:11	TIII ISO nb?	B6	-	-
01	13:53 – 13:56	Int var	B9	-	-
01	14:09:43	TIII ISO nb?	C1	C7.5	SF
01	14:11:03	TIII ISO nb?	C1	C7.5	SF
01	14:29:05	TIII ISO nb?	C4	-	-
01	14:42:43	TIII ISO nb?	C6	-	-
01	14:49:02	TIII ISO nb?	C8	-	-
01	14:57:40	TIII ISO nb?	C8	-	DSF
02	14:46	Int var + EF VER	C7	-	Instrument ?
02	16:09 – 16:16	Int var + ABS	D9	C7.8	SF RBR 2695-15400 RSP III/1
02	16:16 – 16:38	Puls. like	E0-E2	C3.2	SF
19	12:22	Puls. fraca	B2	X1.6	2B RBR 245-15400 RSP IV/2 II/2
03	14:40:42 – 14:40:47	CNT fraco	B5	-	SF
18	13:38	Dots	C7	C6.5	1N RBR 245-606 RSP III/2 V/3
18	13:47	TIII-like nb	C9	C6.5	1N RBR 245-606 RSP III/2 V/3
18	14:15	Dots	D4	-	SF RSP III/1
19	15:49	TIII G fraca	F1	-	RBR 245-15400 RSP CTM/1 LPS

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... Continuação

19	16:22 – 17:06	Puls.+CNT+ fiber+ hand-like	F7-G5	-	RBR 606
19	17:14 – 17:22	CNT var nb	G6-G8	-	2N RBR 245-8800 RSP III/2 II/2 IV/1
19	17:40 – 17:46	nb int var + fiber nb	H1-H2	M6.7	2B RBR 245-15400 RSP III/1 II/1
22	14:50 – 15:09	Int var fraca	D8-E1	X1.2	2B RBR 245-15400 RSP II/1
22	17:47 – 18:03	Puls./Osc. + nb EF	H1-H4	X1.3	2B RSP IV/2
25	14:44 – 14:58	Puls. + CNT + nb EF + VER patch	A5A8-	X1.3	RBR 245-410 RSP III/2
25	15:06 – 15:31	CNT fraco slow var + lace-like fraco	A9-B4	-	RBR 245-410 RSP III/2
26	12:46	TIII + U-like nb	B4	-	RBR 245-410 RSP III/2
26	12:47	TIII nb fraco	B5	C3.4	SF RBR 245-606 RSP III/2
26	13:31:13 – 13:31:14	Puls. nb	C3	M2.0	SN RBR 245-15400 RSP III/3 V/3
26	14:28	Puls. fraco	D3	M2.0	SN RBR 245-15400 RSP III/3 V/3
26	14:30 – 14:37	Puls. forte + CNT	D4	-	RBR 245 RSP III/2
26	15:54	Patch fraco	E9	-	RBR 245 RNS 245
26	16:55	EF nb fraca	G1	-	RNS 245
26	17:44:07	TIII like	H0	-	RBR 245
26	18:01:51	EF nb fraca	H3	C7.4	RBR 245-15400
30	12:17	Patch-like + int var	B2	-	RNS 245 RSP CTM/1
30	14:34 – 14:35	CNT fraco	B5	-	-
31	17:08 – 17:09	CNT fraco	C9	-	RNS 245 RSP CTM/1

NOVEMBRO

01	12:12 – 12:18	Int var	A5-A6	M3.3	-
01	15:17 – 15:19	CNT impuls rise-fall	C4	M1.7	SF RBR 410-606
06	13:53	Patch-like nb	A0	M1.2	SF RBR 410-15400
06	13:36:19-13:56:29	Patch HOR	A1	M1.2	SF RBR 410-15400
06	13:57-13:58	Int var	A1	M1.2	SF RBR 410-15400
06	15:12	ISO DOT intense	A8	M1.1	SF
08	14:39 - 16:20	Int var fraca	C0-C9	M4.2	2F RBR 410-8800 RSP III/1
08	17:00 - 17:50	Int var	D4-D8	-	RBR 410-8800
09	15:26	Dots chain \cap -type	C5	-	-
12	12:50	Patches	A9-B0	-	-
12	15:04 – 15:10	CNT Gradual	C3	-	RBR 1415-15400
14	17:07	TIII ISO	D3	-	SF
27	14:35 – 14:39	Osc. Fraca	B9	-	RBR 245-4995
28	12:30	Patch (coffe grain)	A6	-	-
28	15:43:22-15:44:14	Normal dfdt TIII-like + nb patch	C6	C7.7	RBR245-15400 RSP II/2
28	16:33-16:35	Int var fraca	D1	M6.9	1B RBR 245-15400 RSP II/2 IV/1
28	16:35 – 16:39	Patch-G dfdtCNT	D1	M6.9	1B RBR 245-15400 RSP II/2 IV/1
29	12:03	Int var (2 sec)	A4	-	RBR 410-15400
29	11:44	CNT fraco	A2	-	RBR 245-606
29	11:47	Patch LBxfreq	A2	-	RBR 245-606
29	12:48:10	ISO Patch nb	A8	C6.0	RBR 410-8800
29	12:49	Int var	A8	C6.0	RBR 410-8800

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... Conclusão

29	12:50	Intense Patch (2 sec)	A8	C6.0	RBR 410-8800
29	13:27:22	Int var	B2	-	RBR 245-1415
29	14:05 – 14:06	Patch G (6)	B6	C7.6	SF RBR 245-15400 RSP III/2 II/2
29	17:01 – 17:11	Int var fraca	D4	C3.5	SF RBR 245-15400 RSP V/2
29	17:27	Int var + drift EF	D6	C1.8	RBR 245-410 RSP III/2 V/3

DEZEMBRO

04	15:37	EF fraca	D5	-	-
12	12:00	TIII-like nb	A1	-	-
12	13:14	Dots	B6	-	-
13	14:24	Patch fraco	D5	-	-
13	14:26 – 14:31	CNT Gradual	D5-D6	X6.2	3B RBR 245-25400 RSP III/1 II/3
13	15:33	CNT	E9	-	RBR 245

- * Abreviações das estruturas finas: CNT: emissão contínua; EF: Estrutura Fina; EFT: Estrutura Fina em Tempo; TIII: Tipo III; G: Grupo de < 10 estruturas; GG: Grupo de > 10 estruturas; ISO: estrutura isolada; RS: “Reverse Slope” – taxa de deriva inversa; nb: banda estreita; ib: banda intermediária; bb: banda larga; NT: curta duração; BT: longa duração; dfdt: taxa de deriva em frequência; Puls.: Pulsações; Osc.: Oscilações; U: na forma de U; U inv.: na forma de U invertido; int. var.: com variação da intensidade com a frequência; HOR: Horizontal; VER: vertical.; Bxfreq: Baixa Frequência; LBxfreq: Limite de Baixa Frequência; Atfreq: Alta Frequência; LAtfreq: Limite de Alta Frequência; ABS: Absorção; Nclass: Não classificada.
- ** As siglas para a atividade associada (eventos em raios-X e rádio em diversas frequências) são as mesmas adotadas pelo “Space Environment Center” (gopher://solar.sec.noaa.gov).

3 - CATÁLOGO DAS EXPLOSÕES SOLARES REGISTRADAS

Este Catálogo é composto de uma seqüência de figuras representando os registros de todas as explosões solares observadas pelo instrumento Brazilian Solar Spectroscopie durante o ano. Os registros das explosões solares são apresentados na forma de **espectro dinâmico** (a variação da intensidade da emissão em função do tempo e da freqüência). A Figura 3 mostra um exemplo ilustrativo de um espectro dinâmico gerado a partir de dados de explosões solares apresentando estruturas finas.

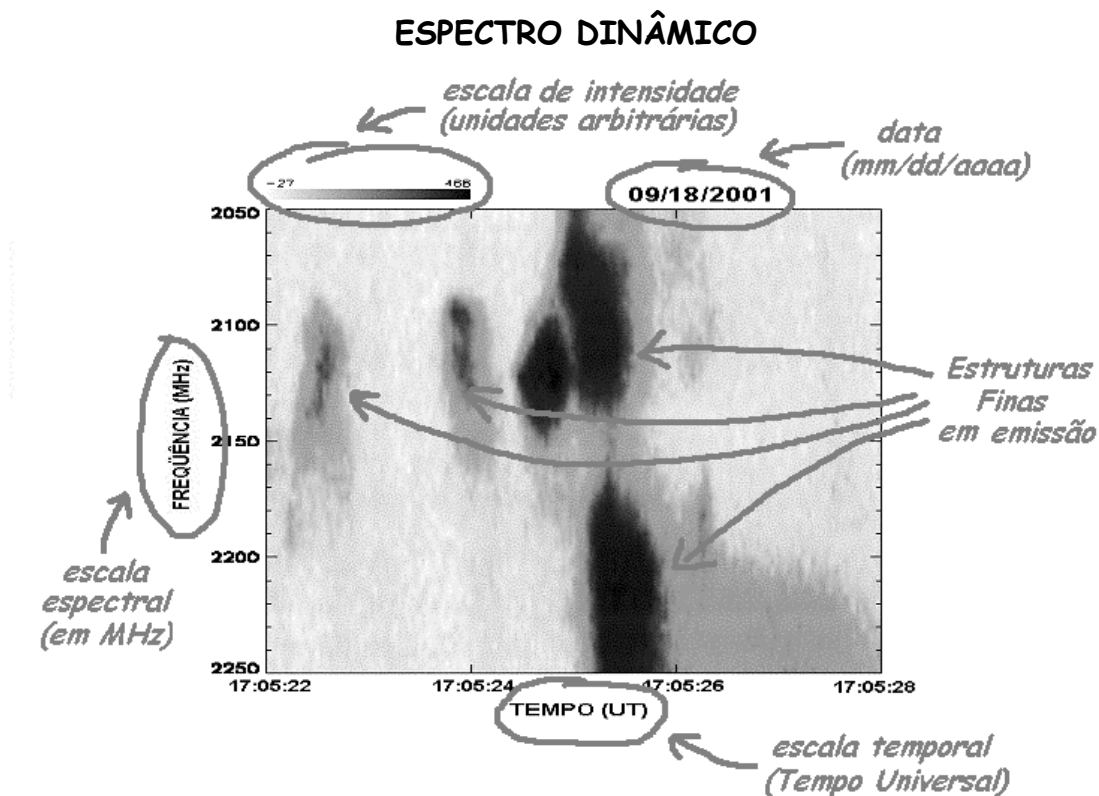
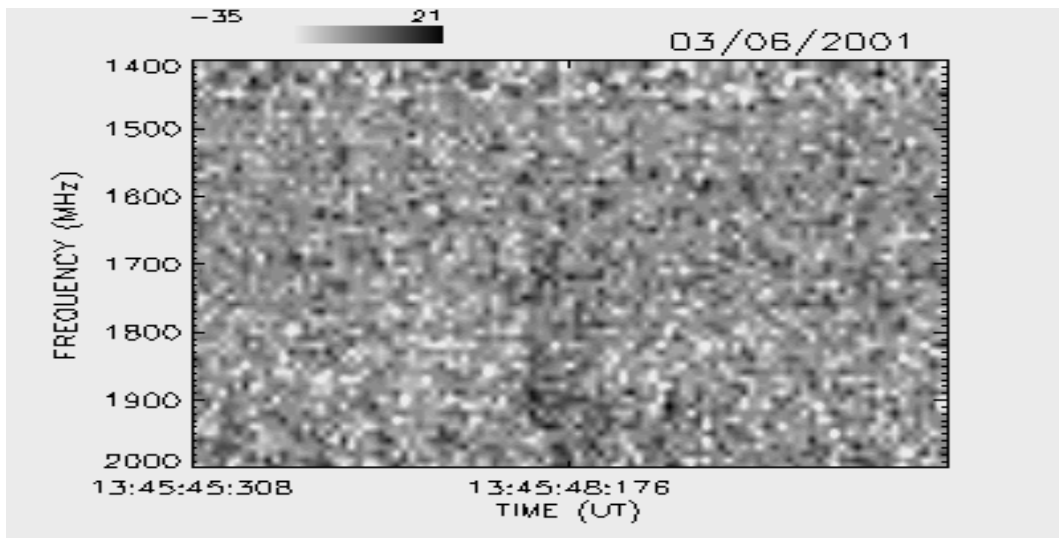


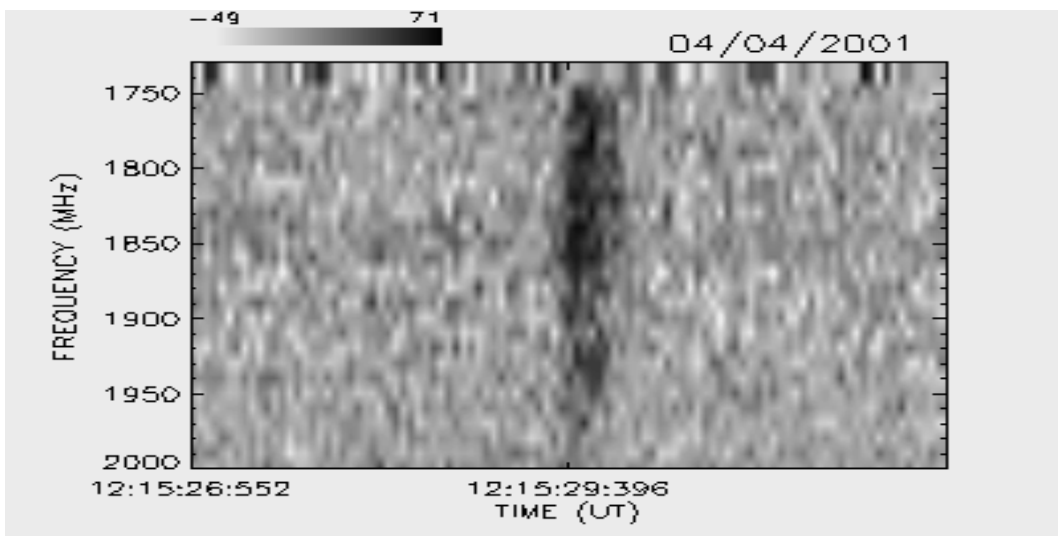
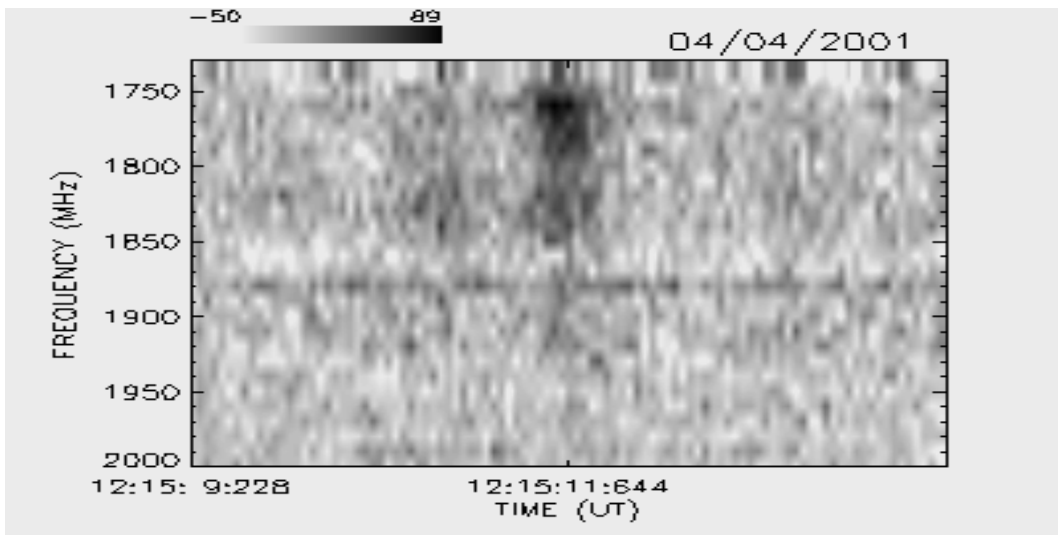
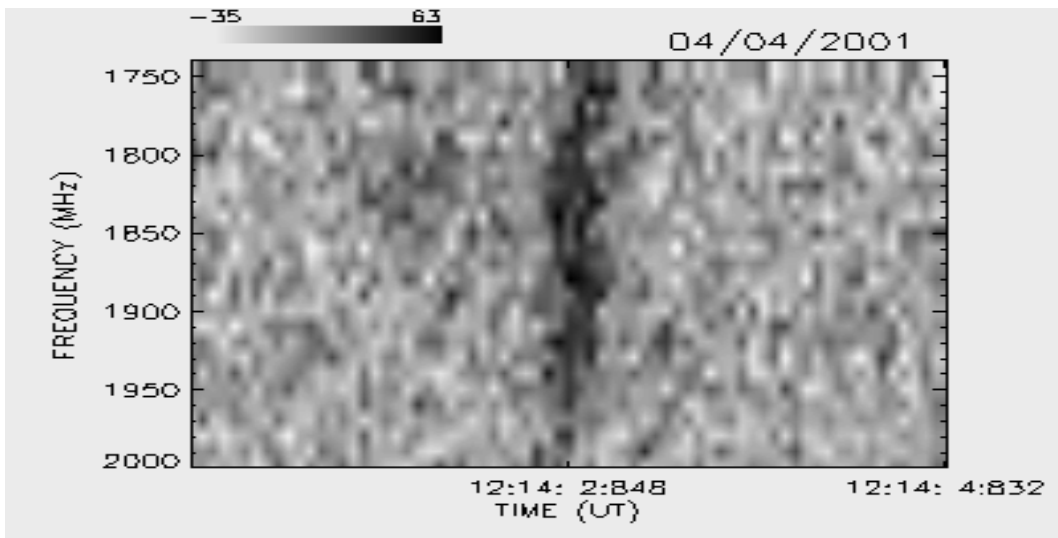
FIGURA 3 – Exemplo de espectro dinâmico gerado a partir dos dados de explosões solares observadas pelo BSS. Na parte superior da figura, é representada uma escala de intensidade (em unidades arbitrárias) e a data da explosão na forma (mm/dd/aaaa); os eixos vertical e horizontal representam, respectivamente, os intervalos em freqüência (em MHz) e em tempo (em Tempo Universal) em que foram registradas as emissões. Nota-se que os valores da freqüência no eixo vertical crescem para baixo, conforme convenção adotada internacionalmente.

O Catálogo completo dos espectros dinâmicos das explosões registradas pelo BSS ao longo do ano de 1999 é apresentado a seguir. Cabe ressaltar que neste Catálogo não houve preocupação em apresentar as explosões de acordo com qualquer tipo de classificação morfológica ou fenomenológica. Os espectros dinâmicos estão dispostos em ordem puramente cronológica. Uma catalogação das explosões baseada em aspectos morfológicos pode ser encontrada em Fernandes et al. (2003).

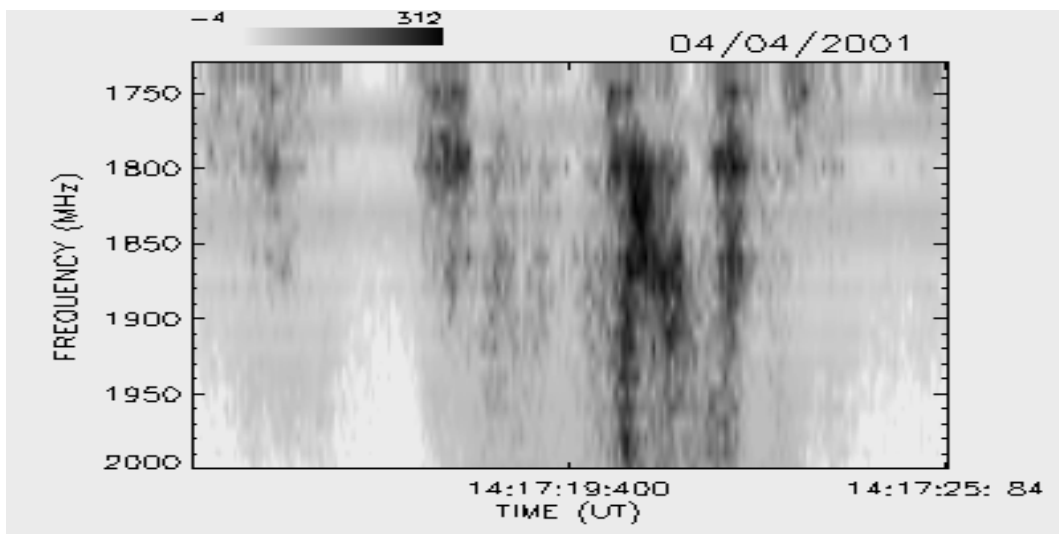
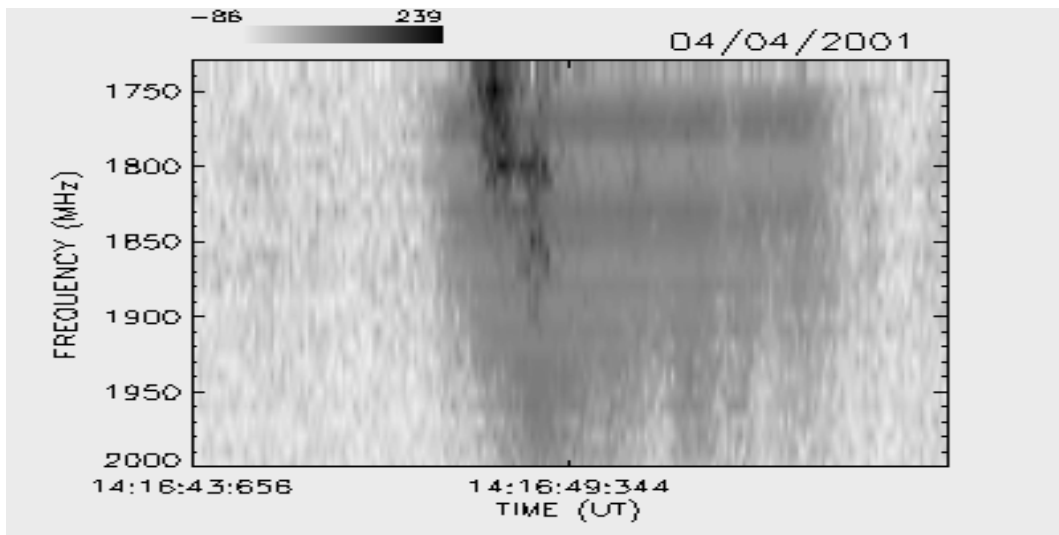
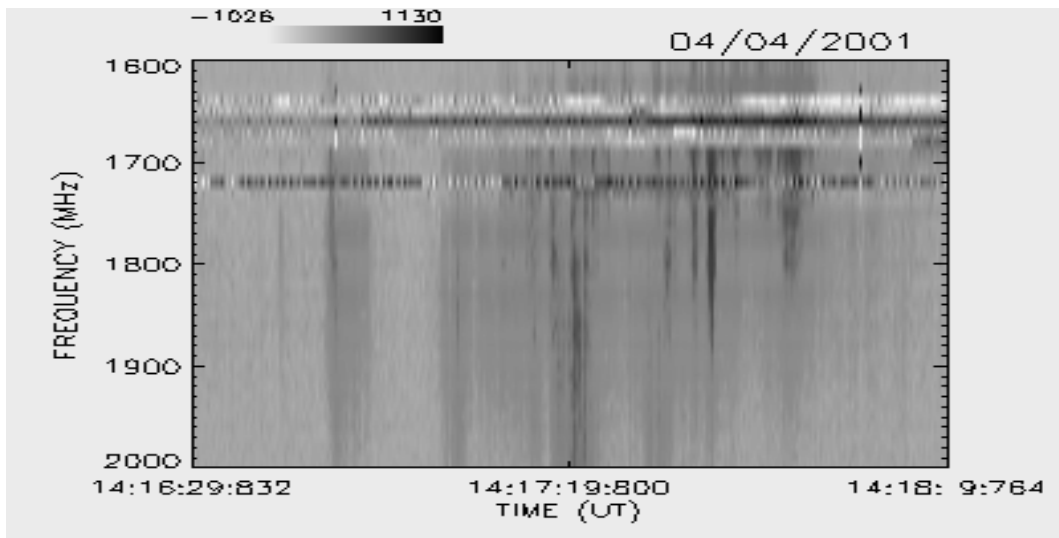
MARÇO / 2001



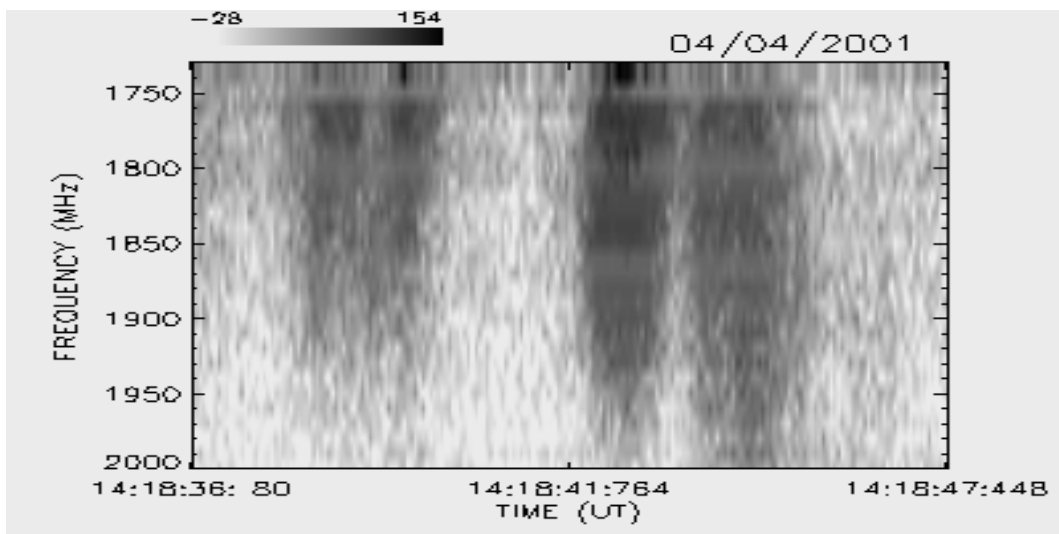
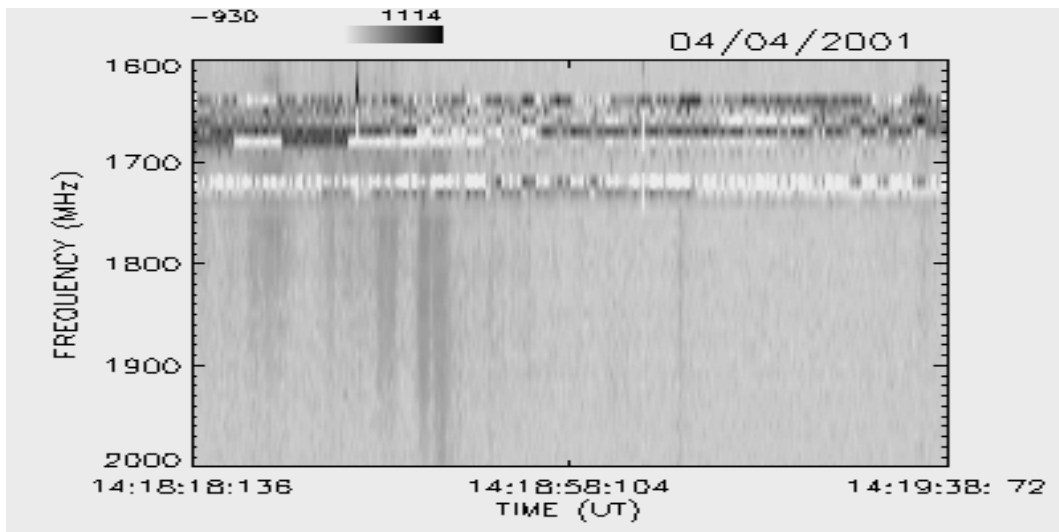
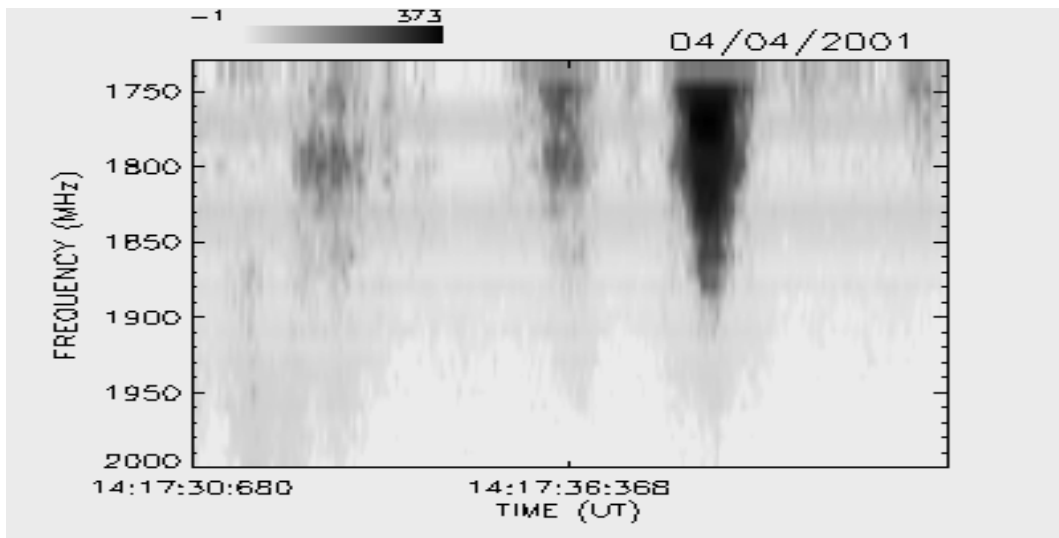
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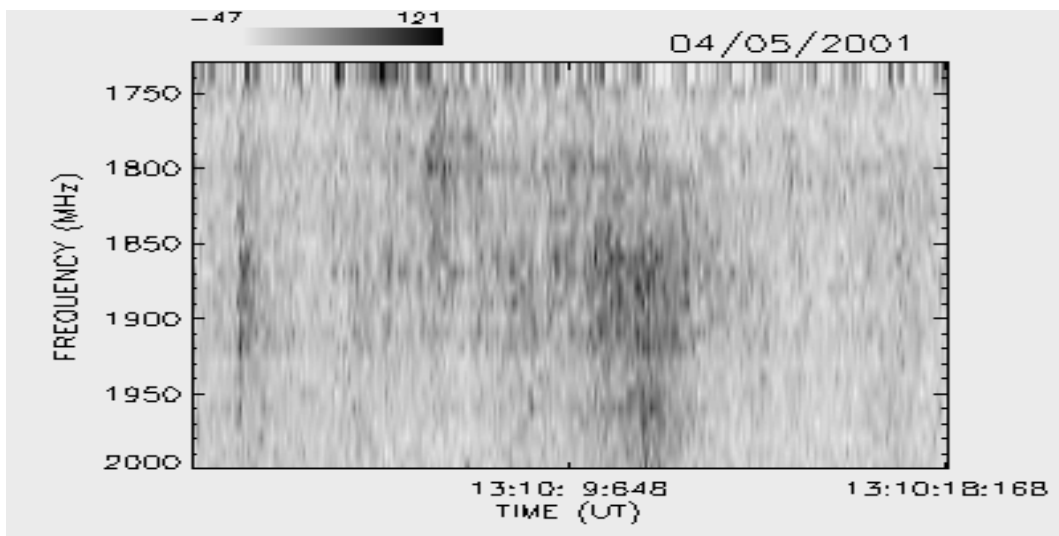
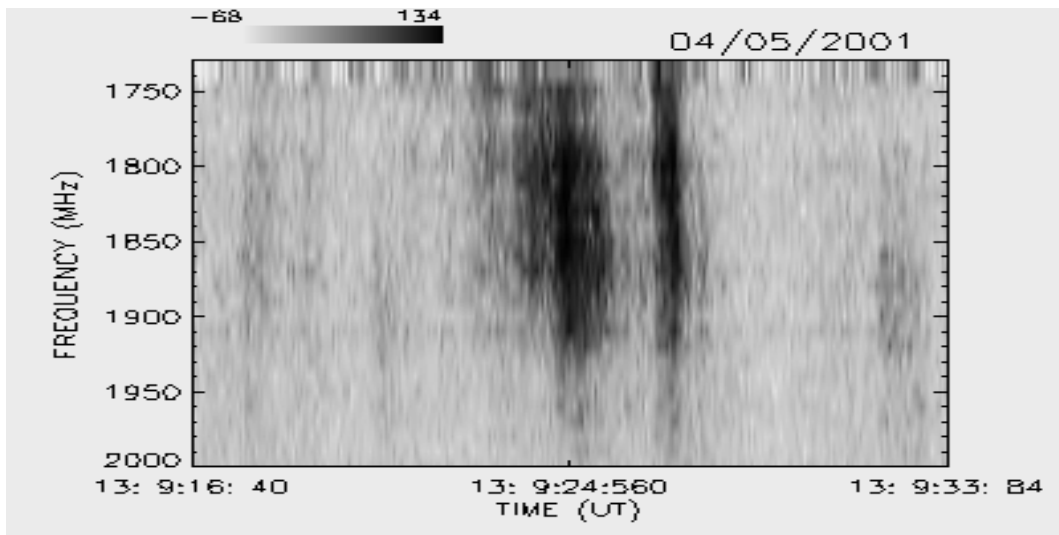
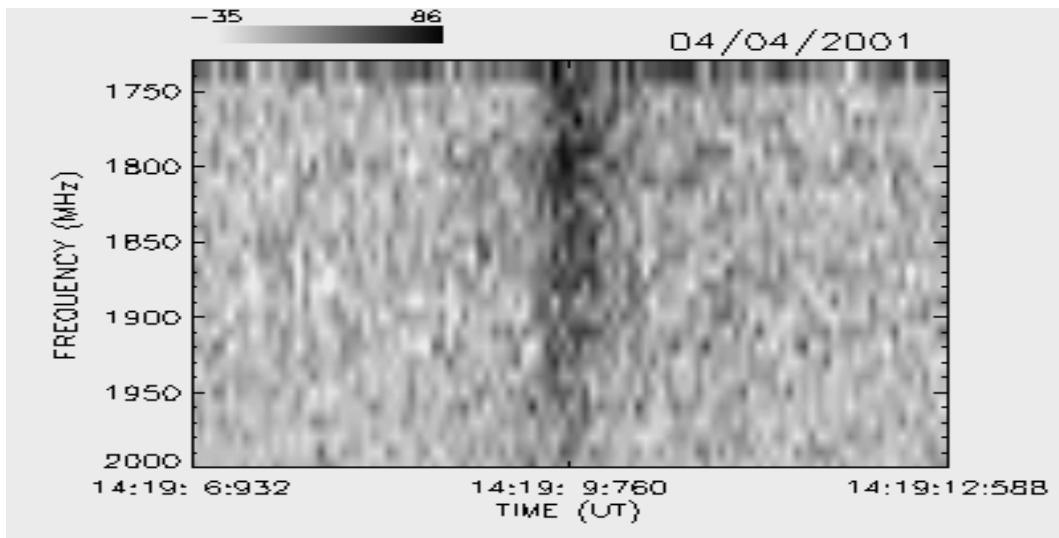
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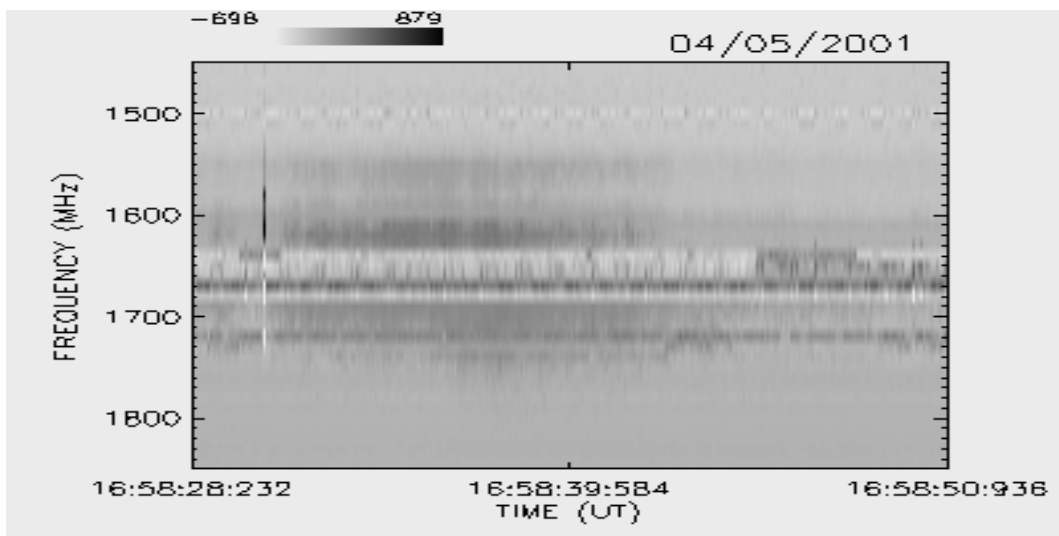
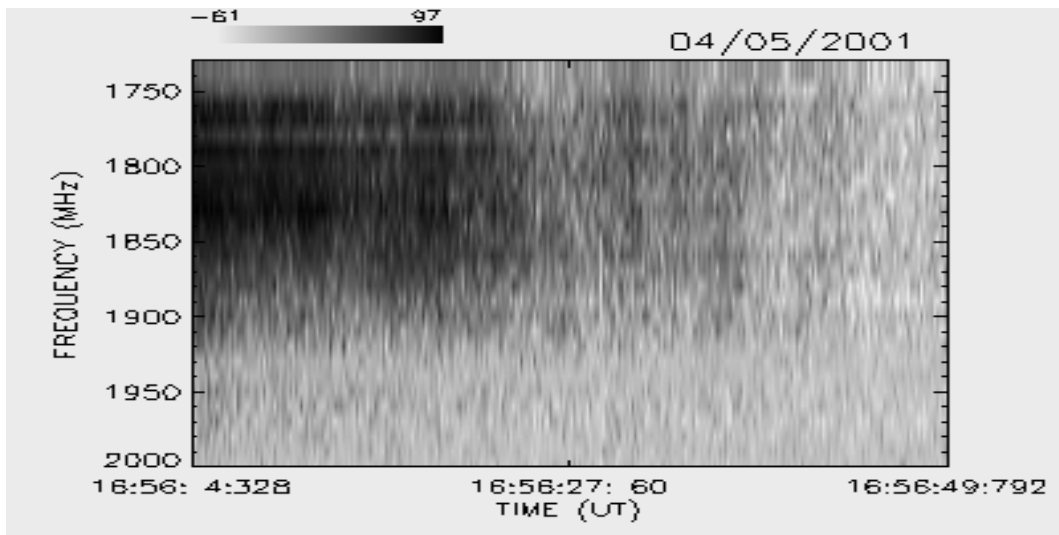
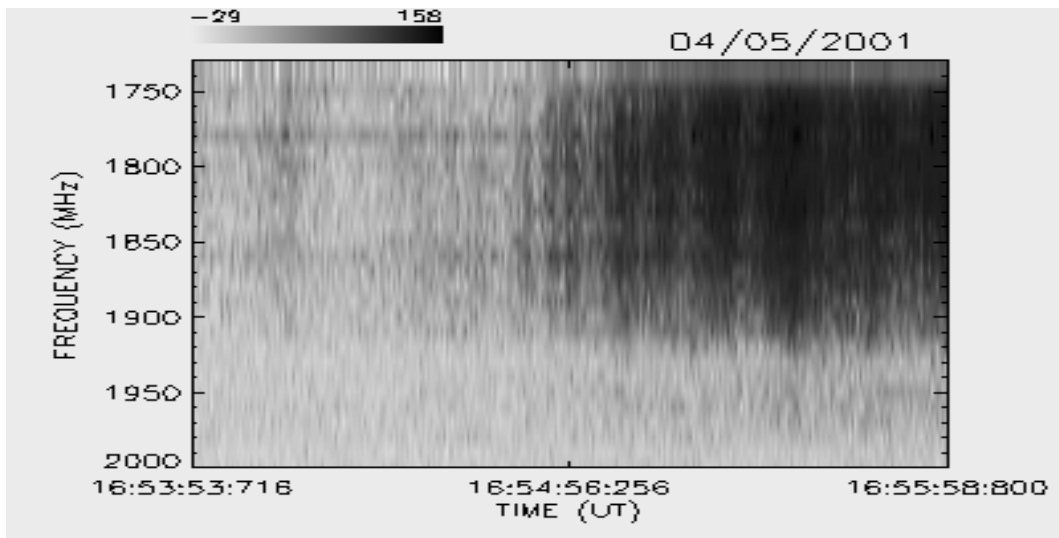
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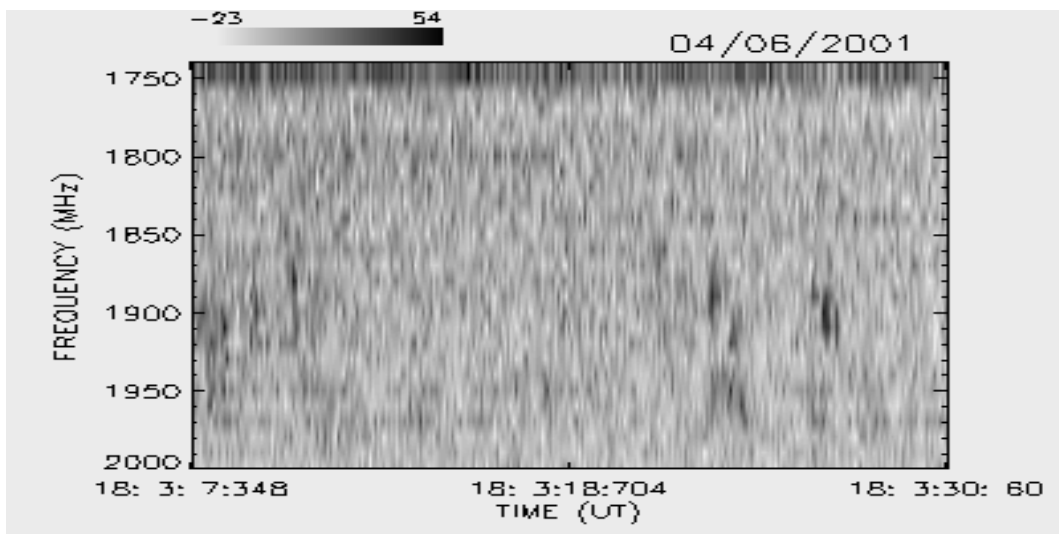
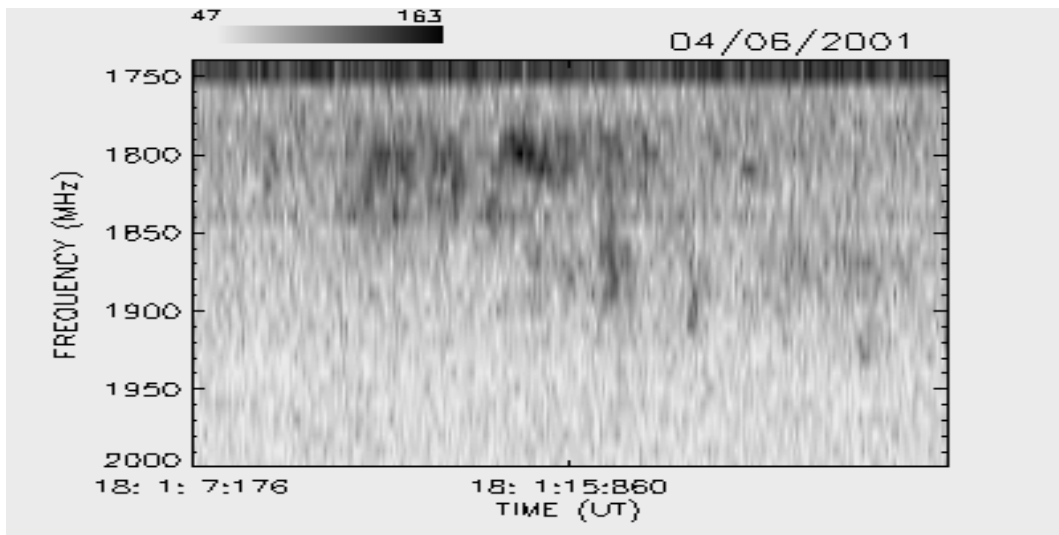
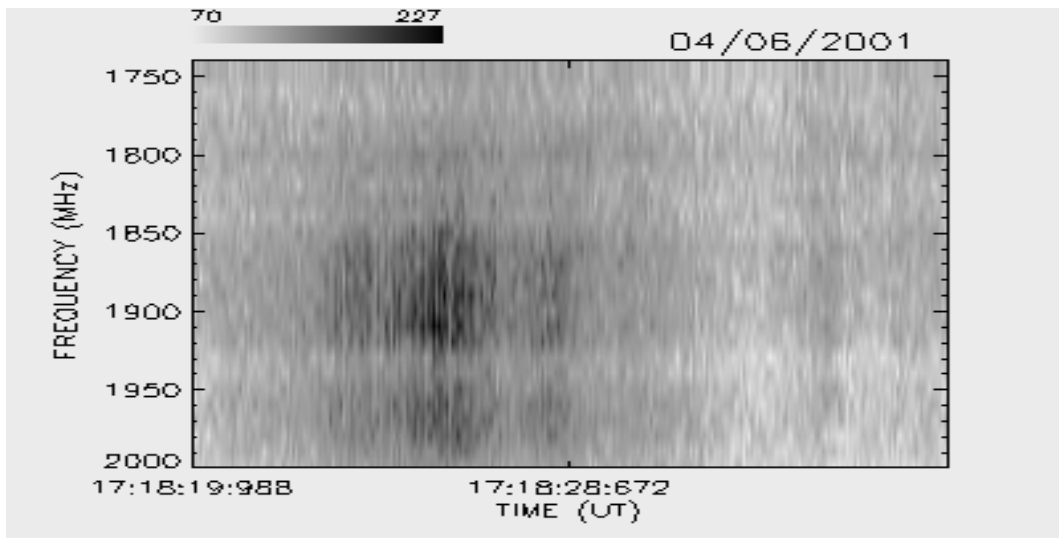
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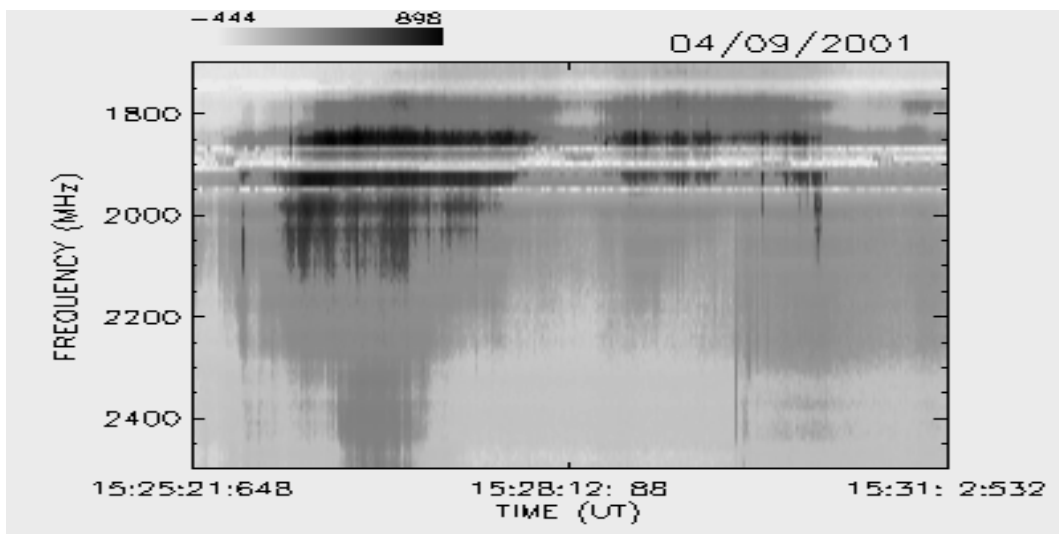
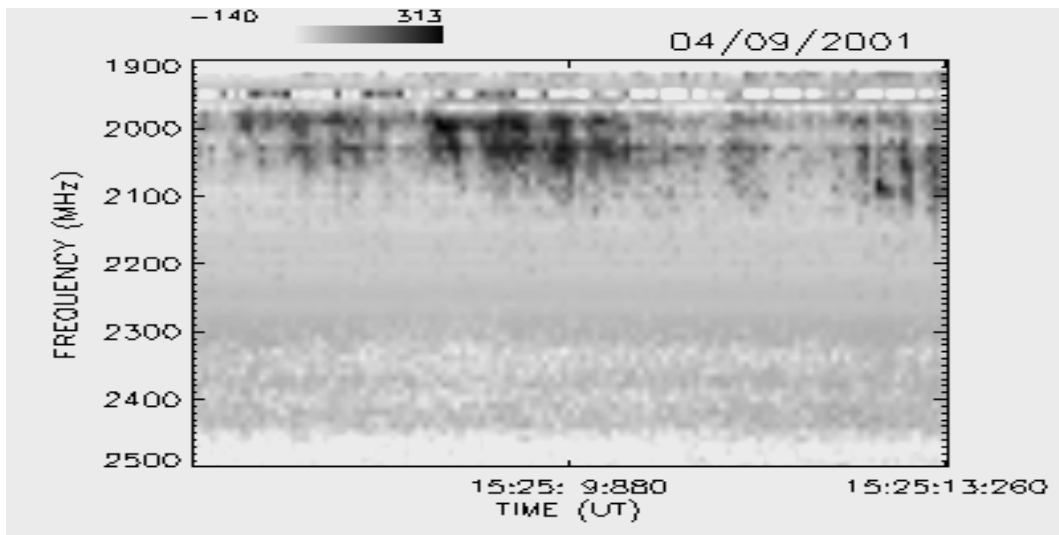
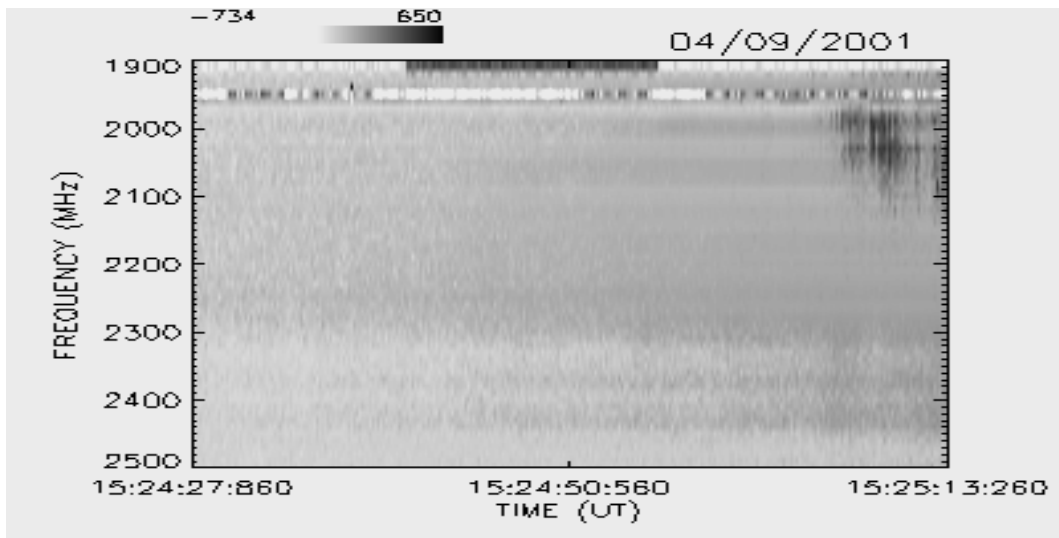
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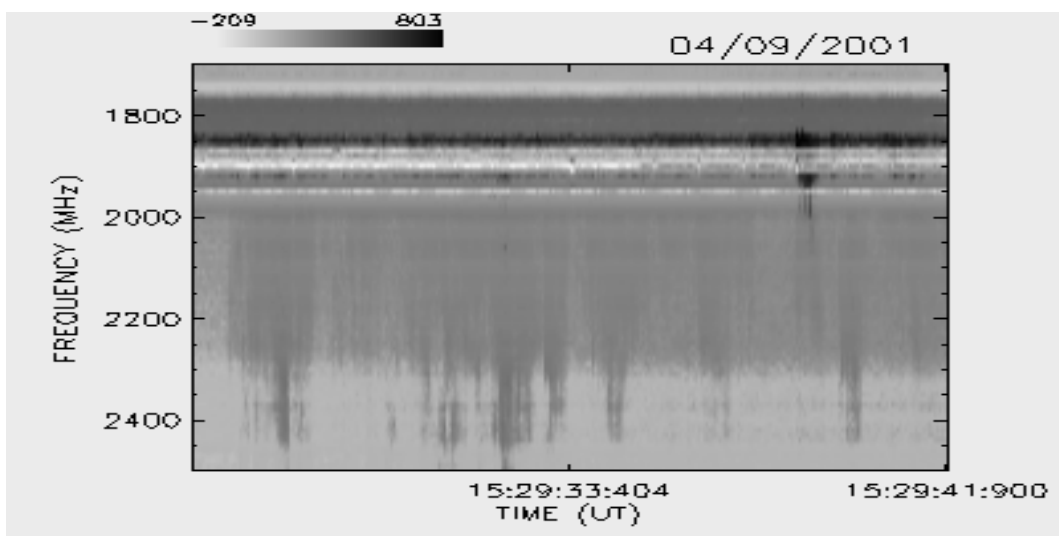
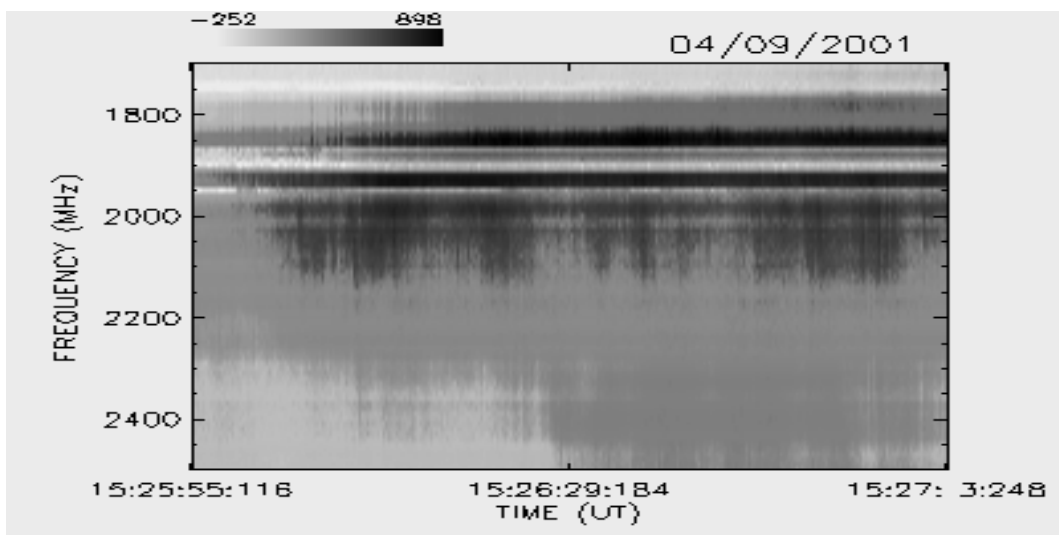
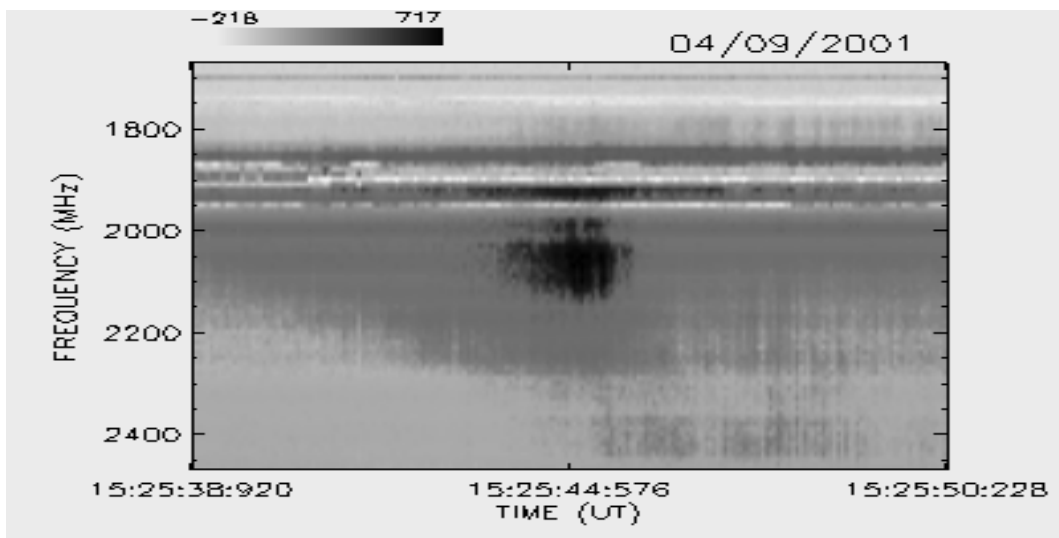
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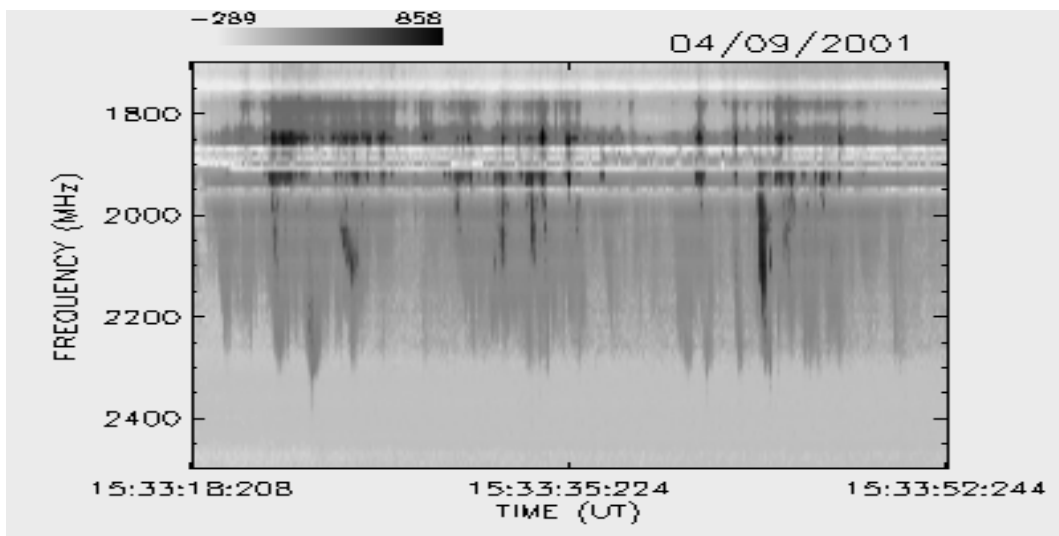
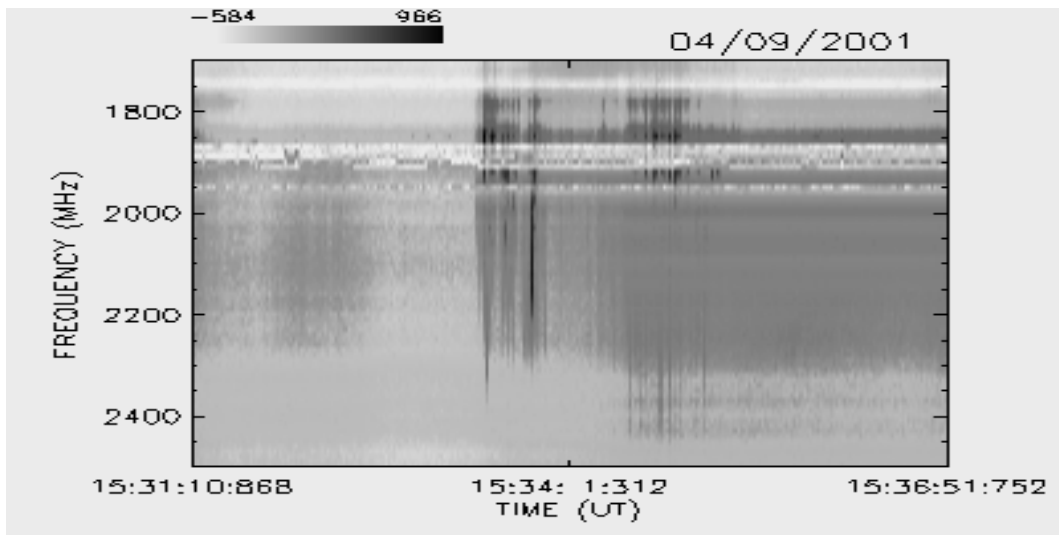
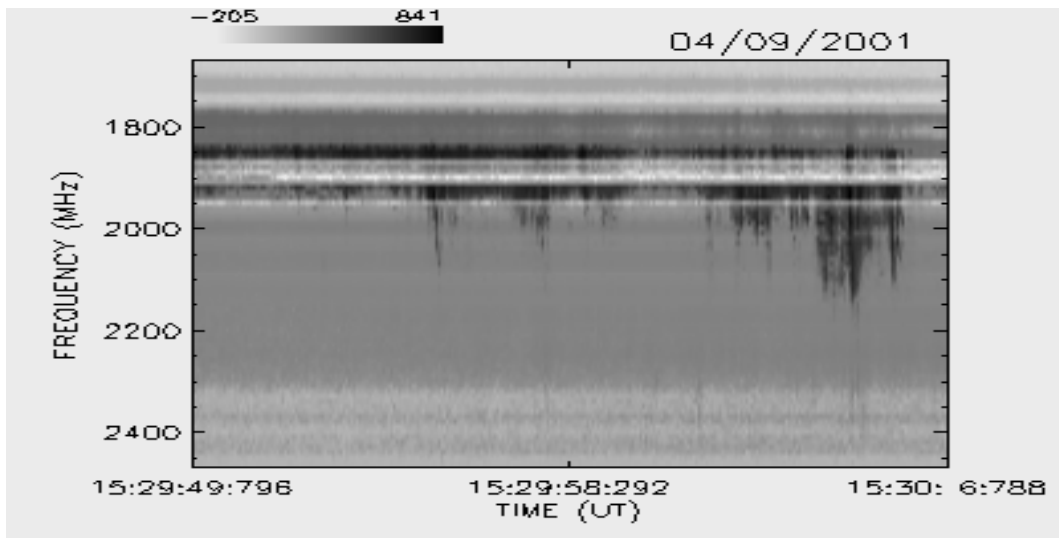
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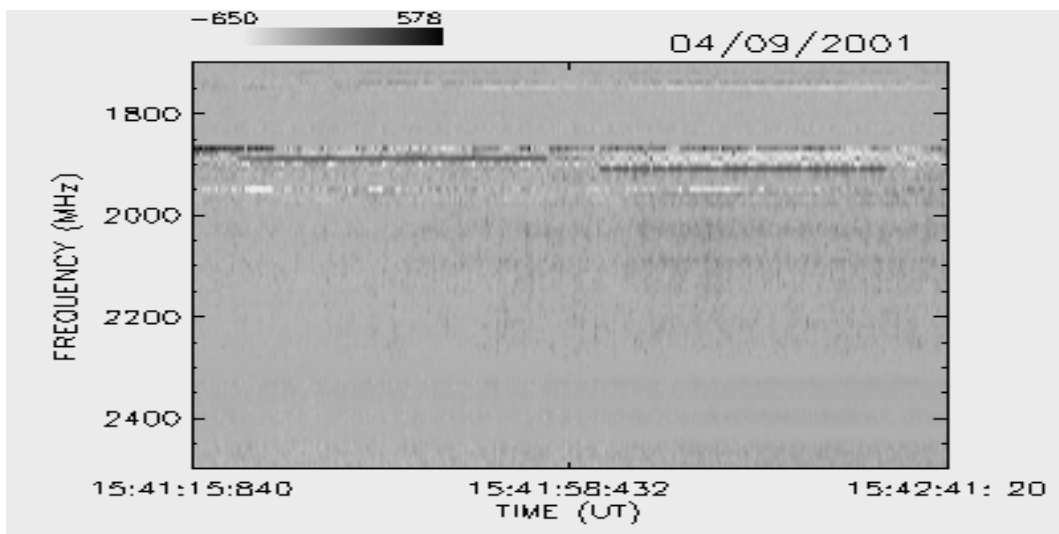
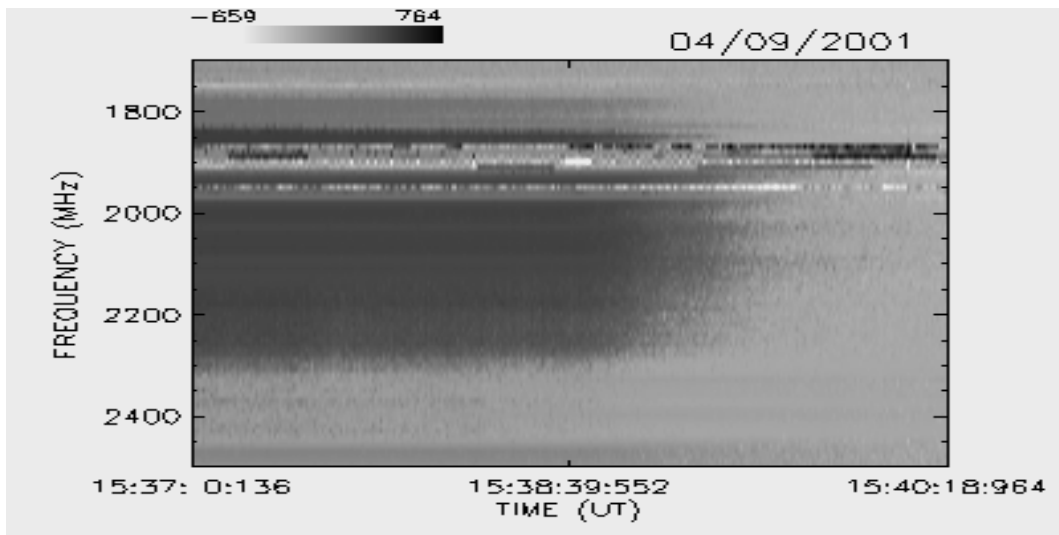
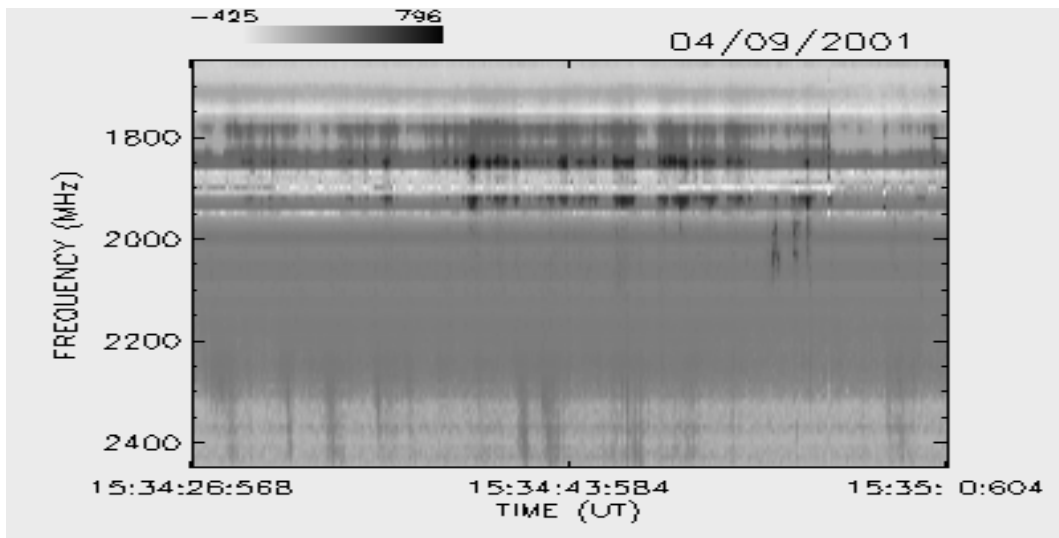
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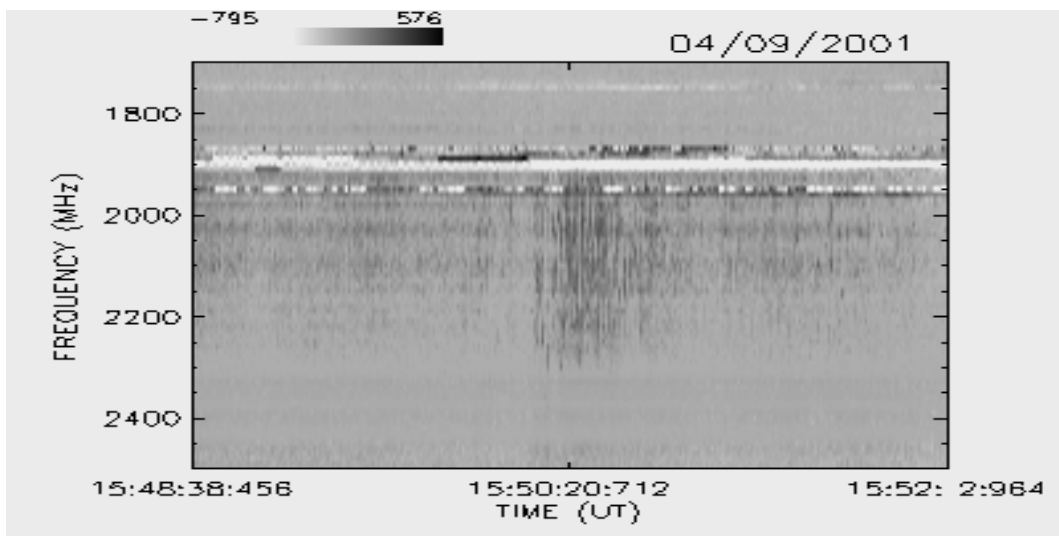
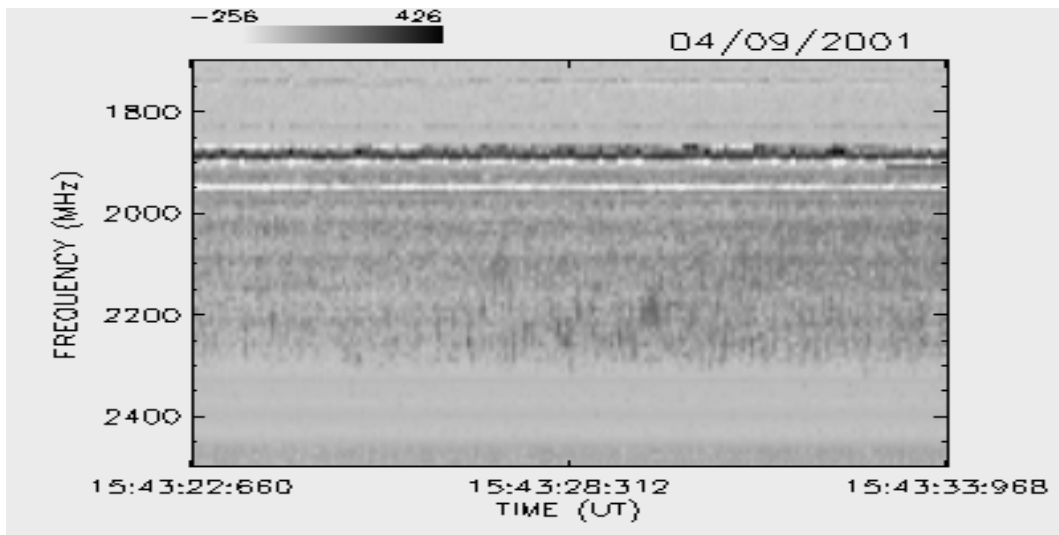
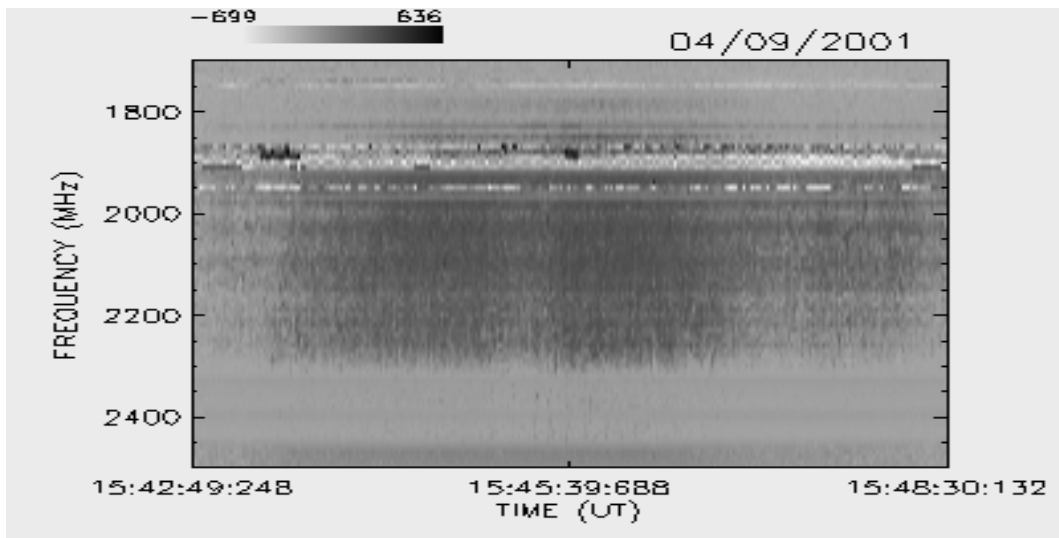
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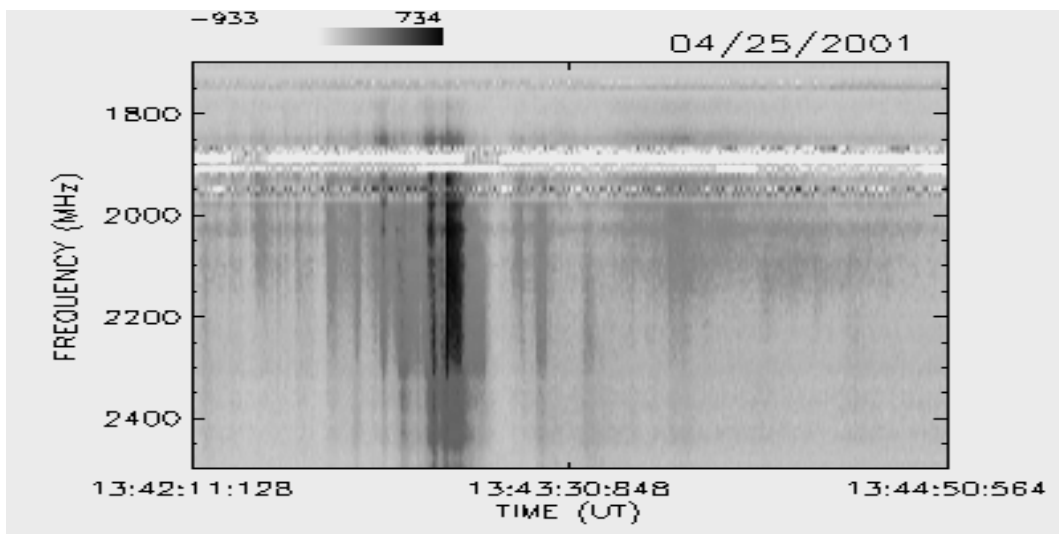
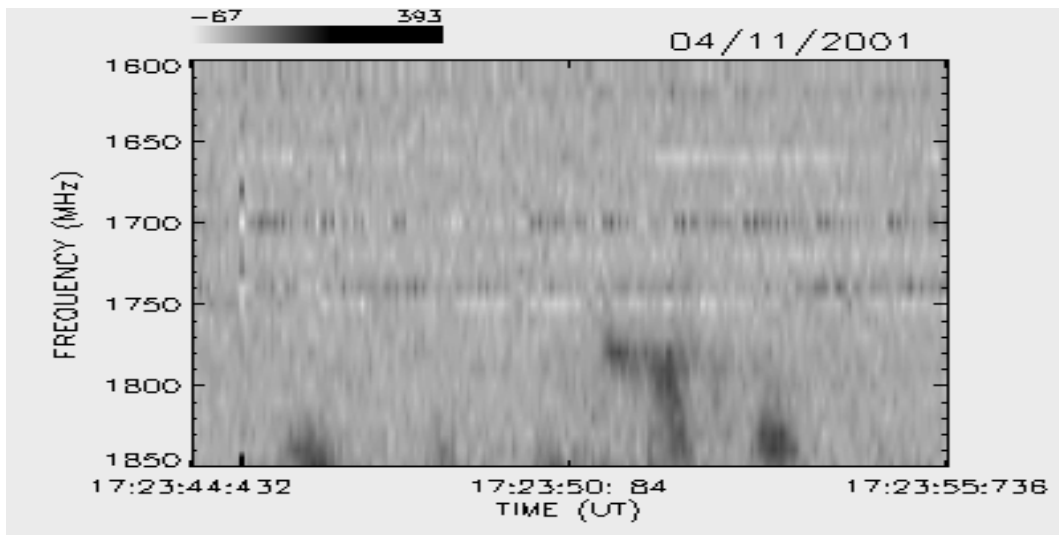
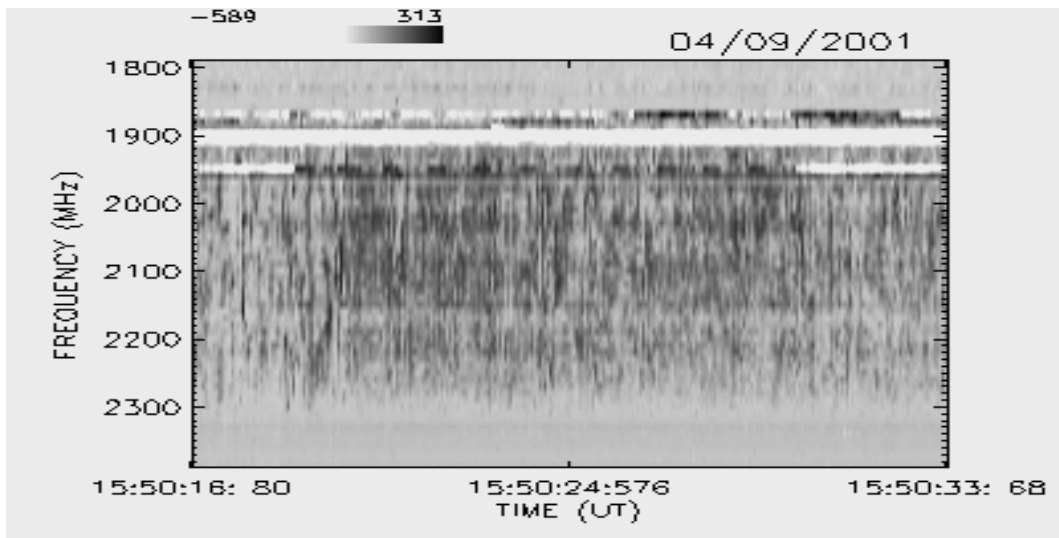
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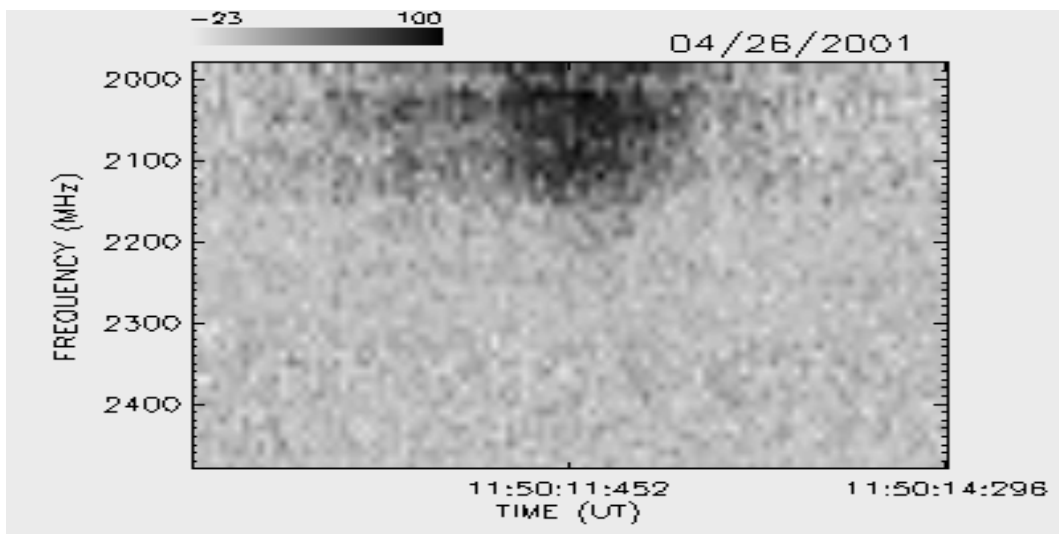
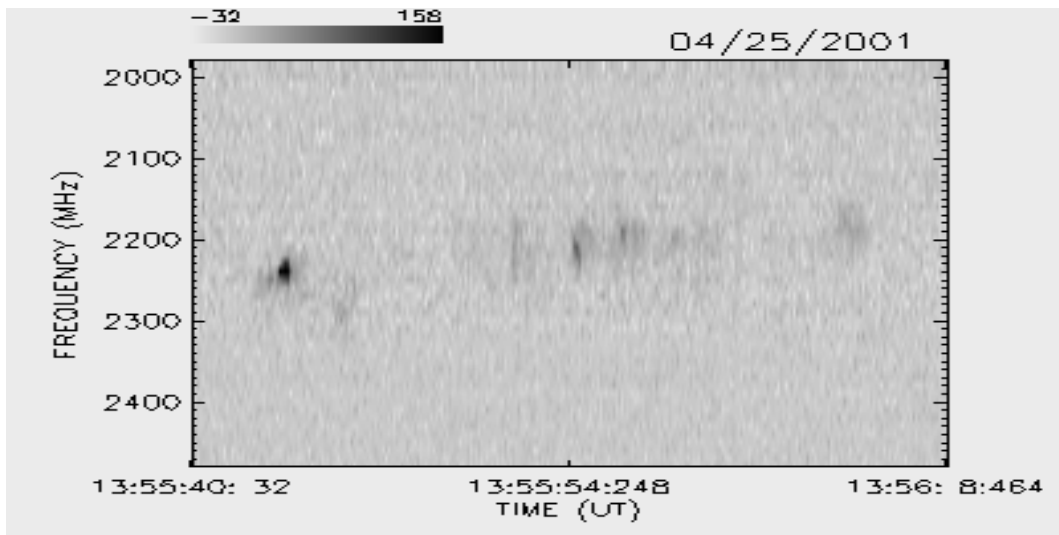
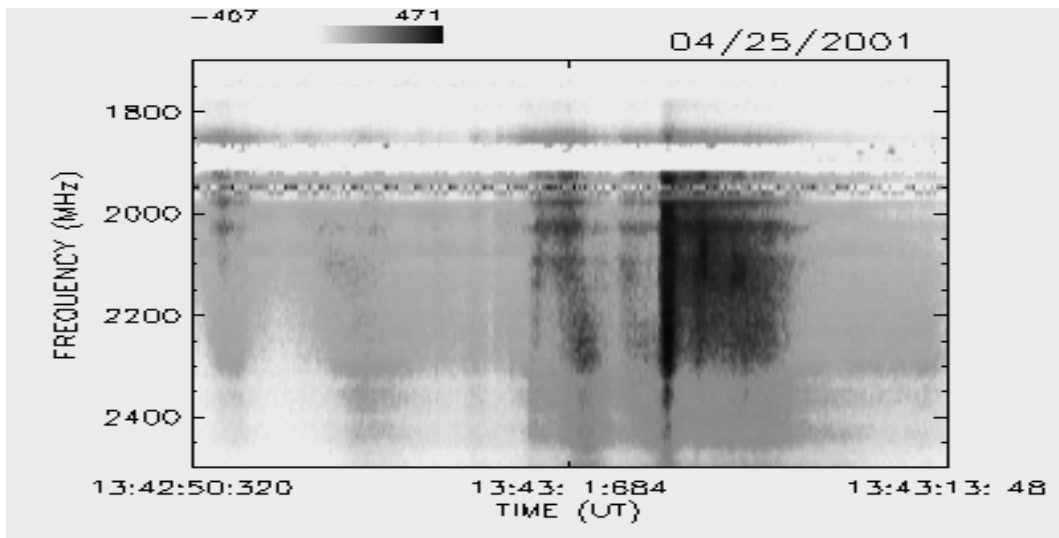
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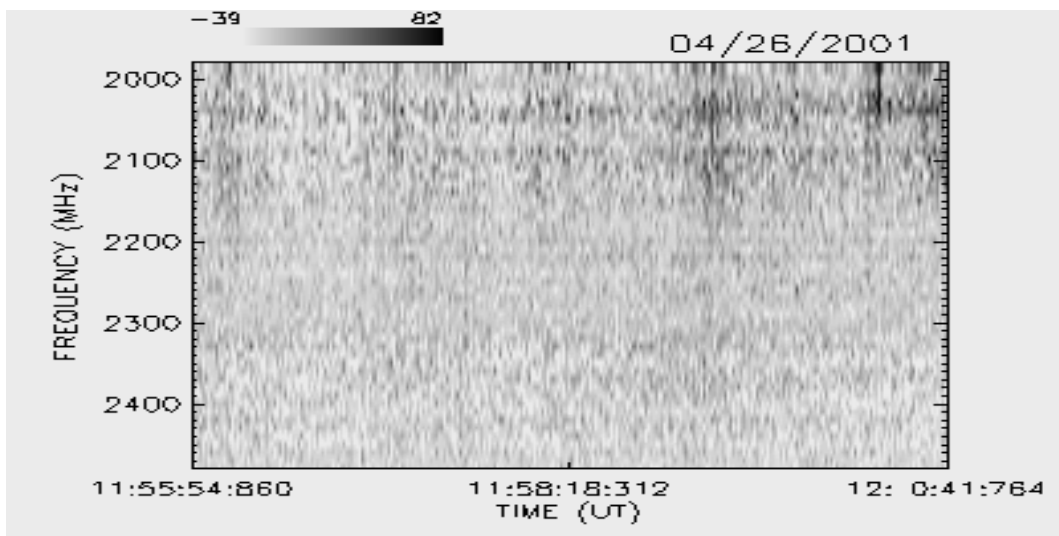
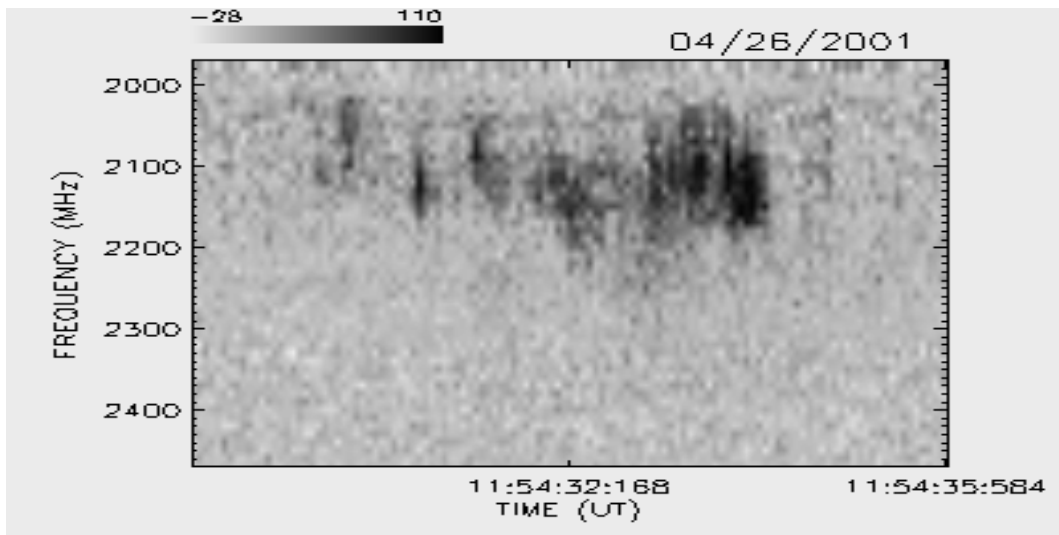
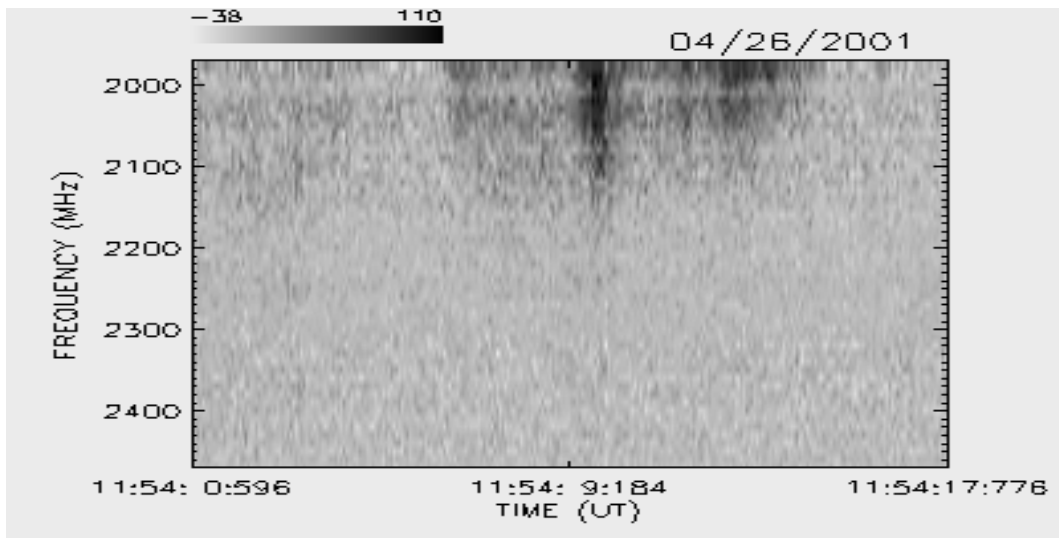
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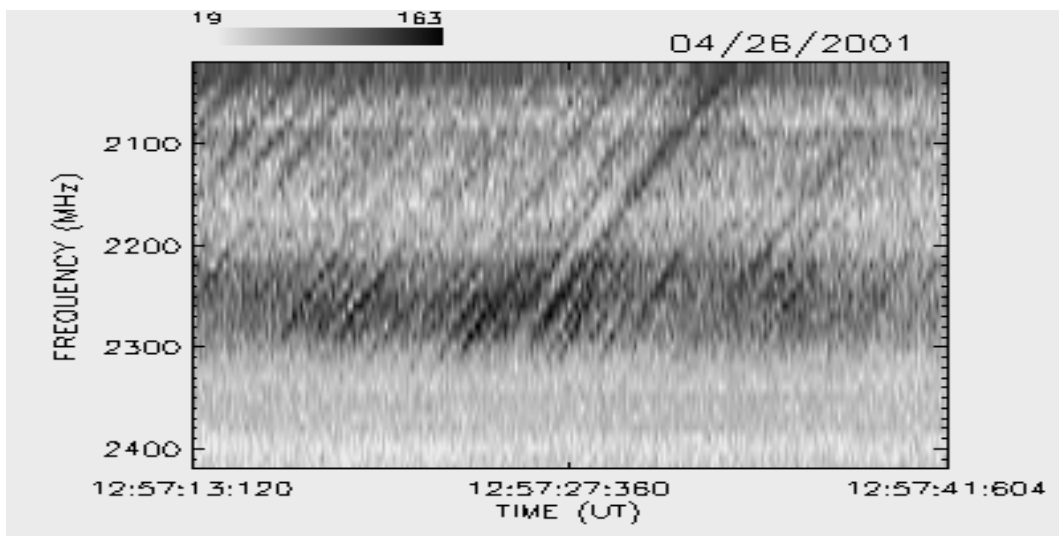
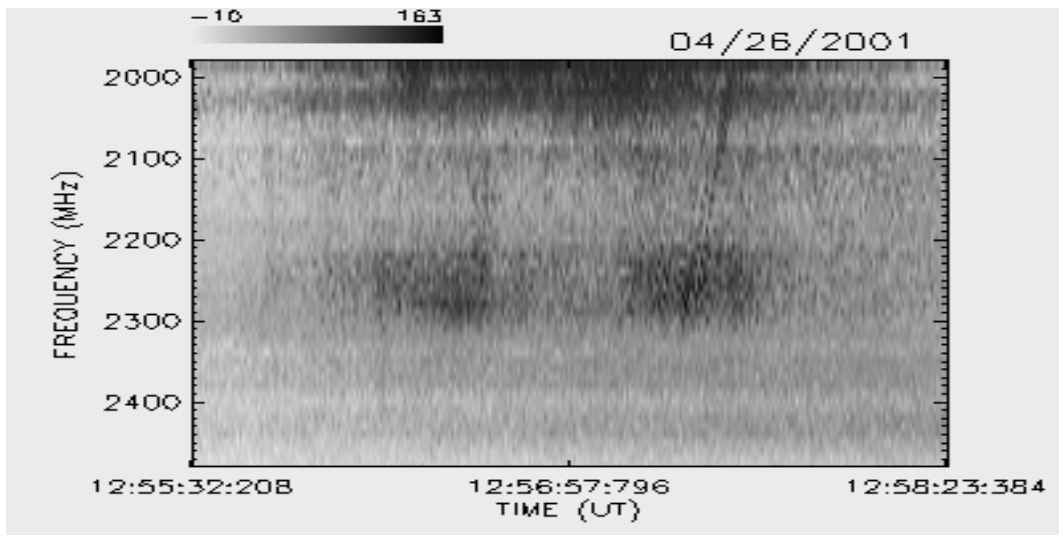
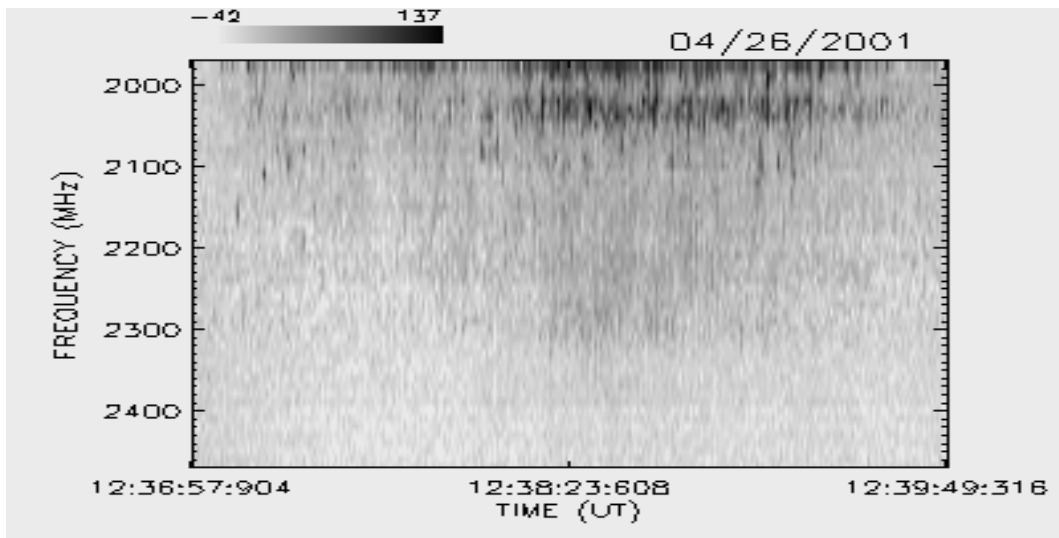
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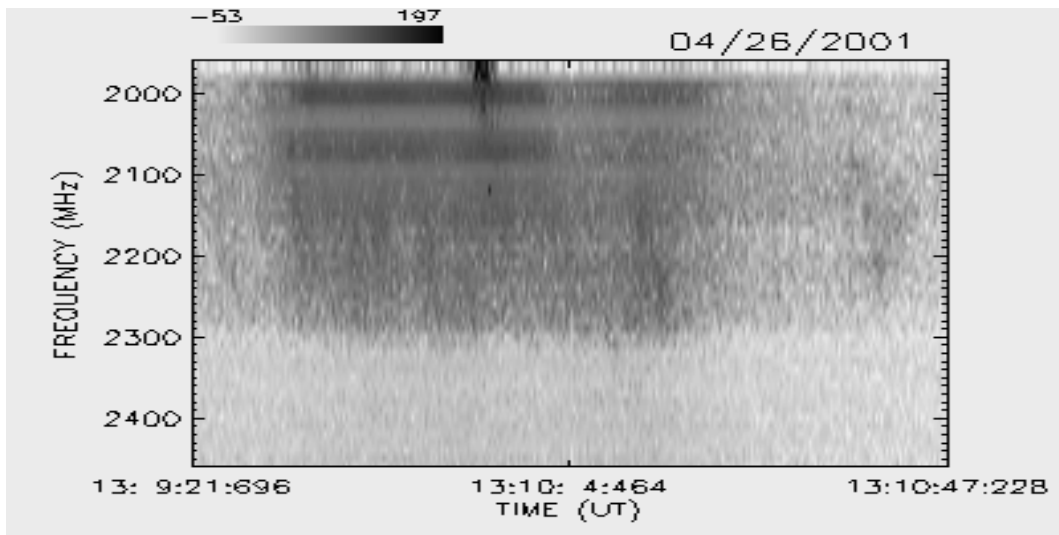
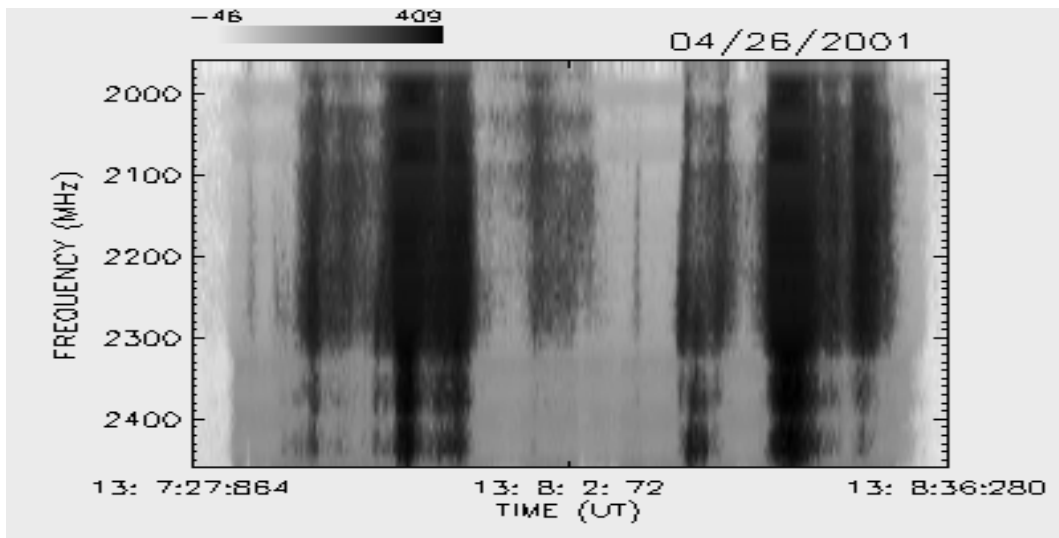
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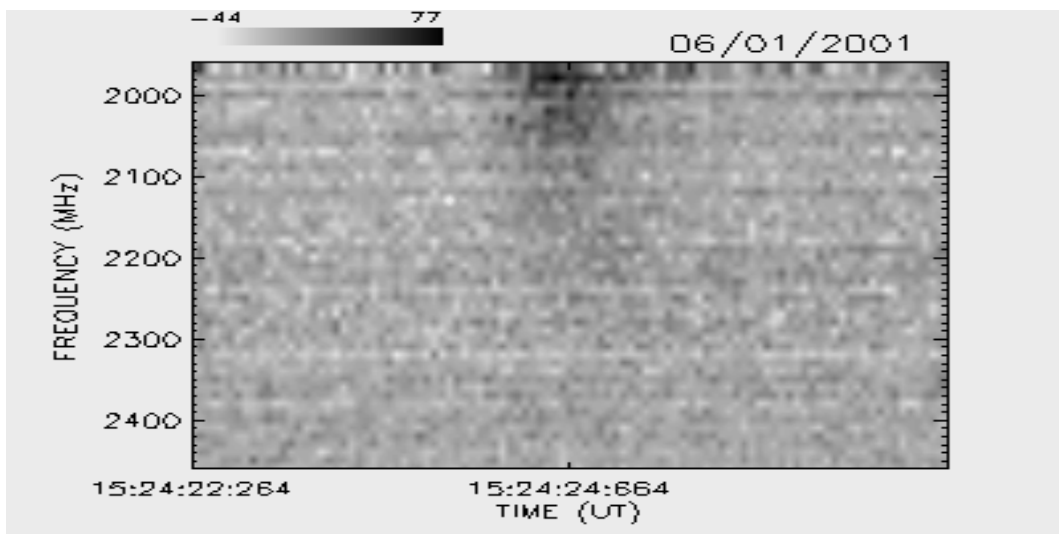
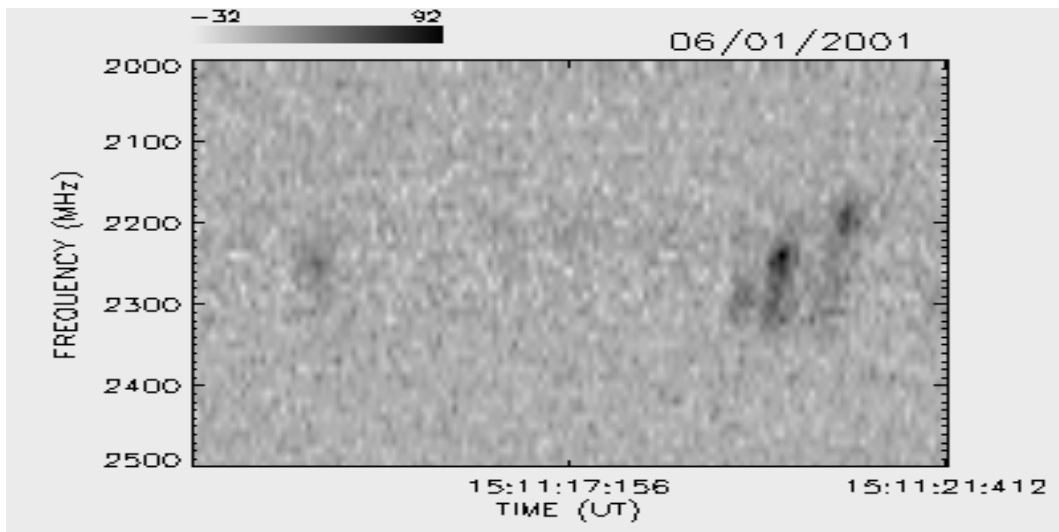
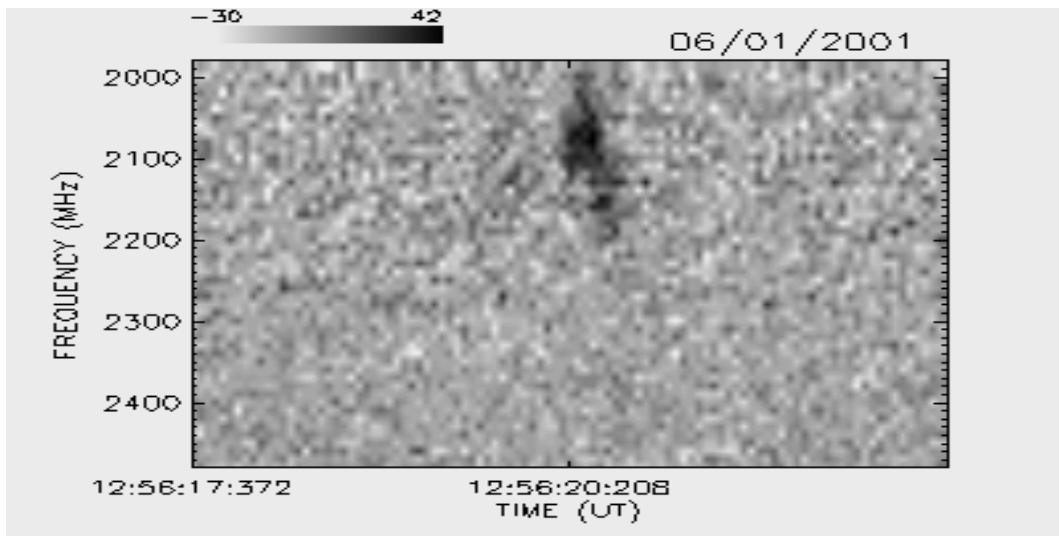
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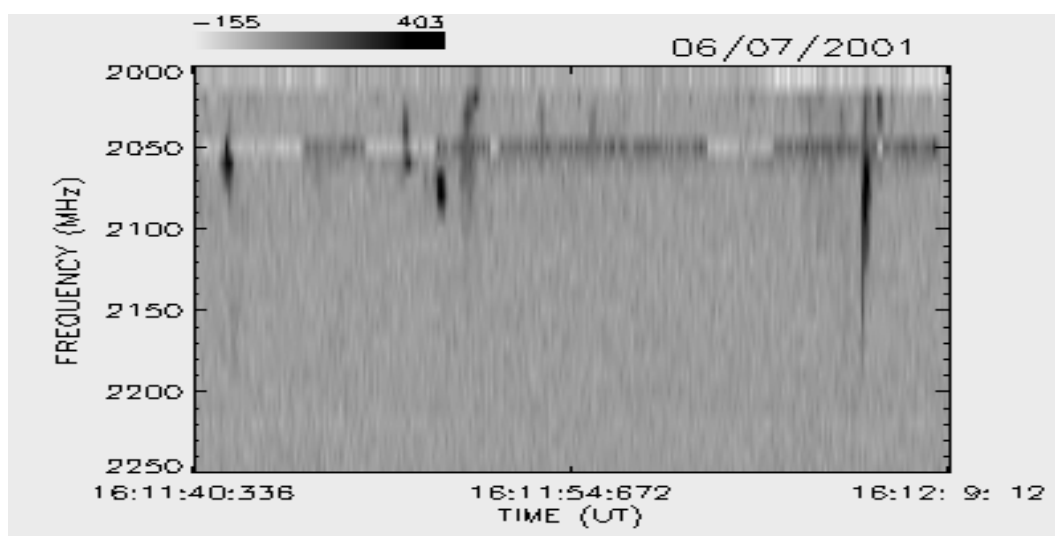
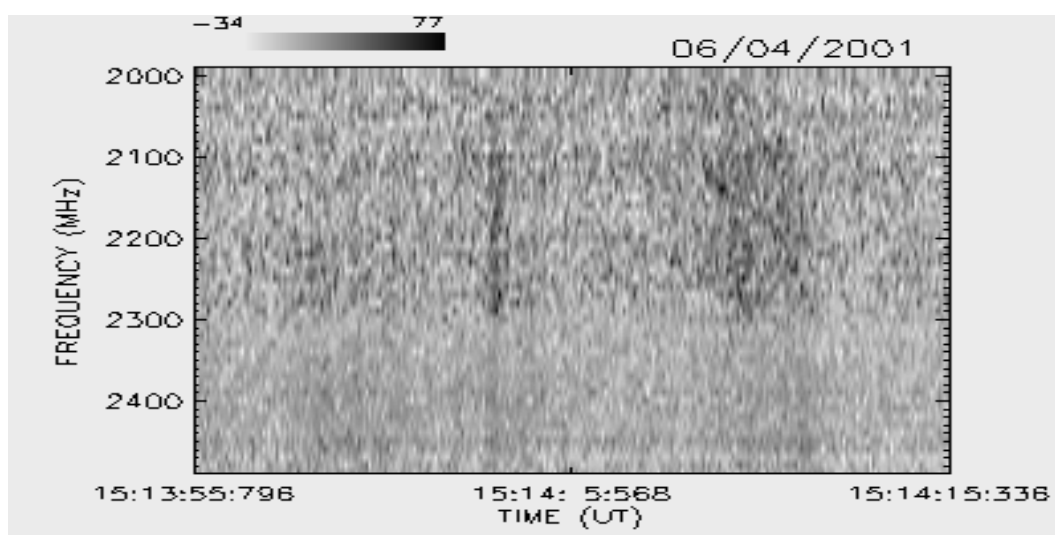
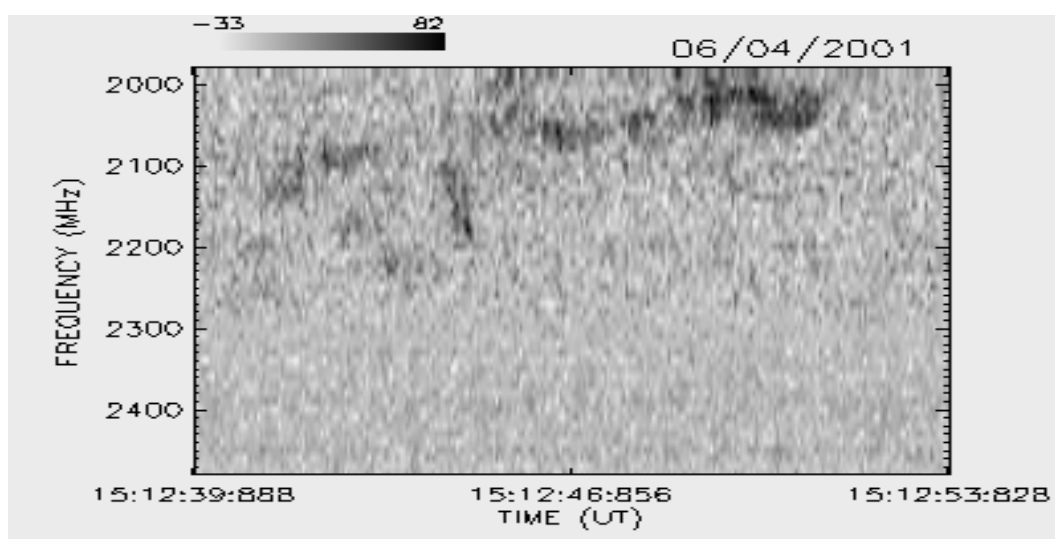
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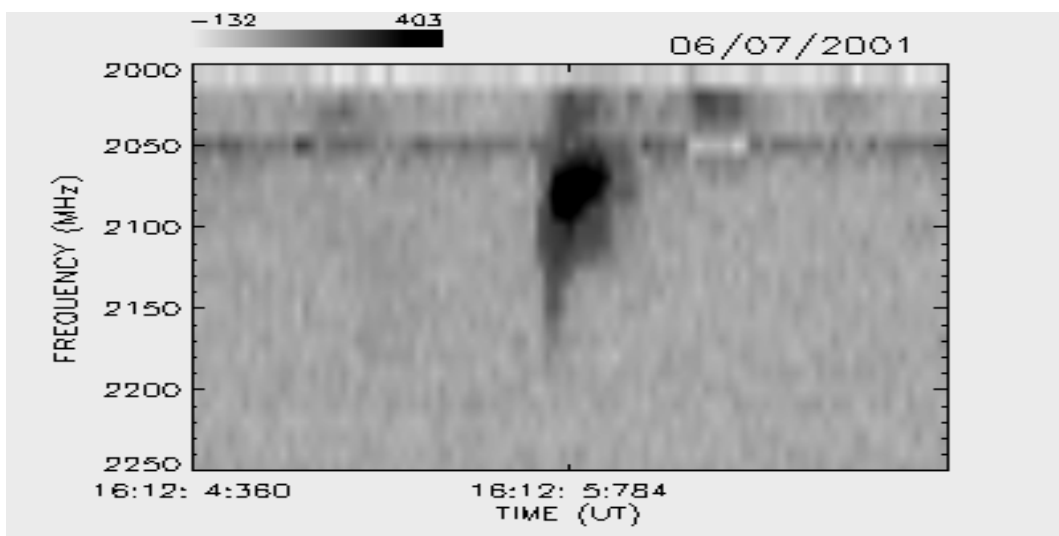
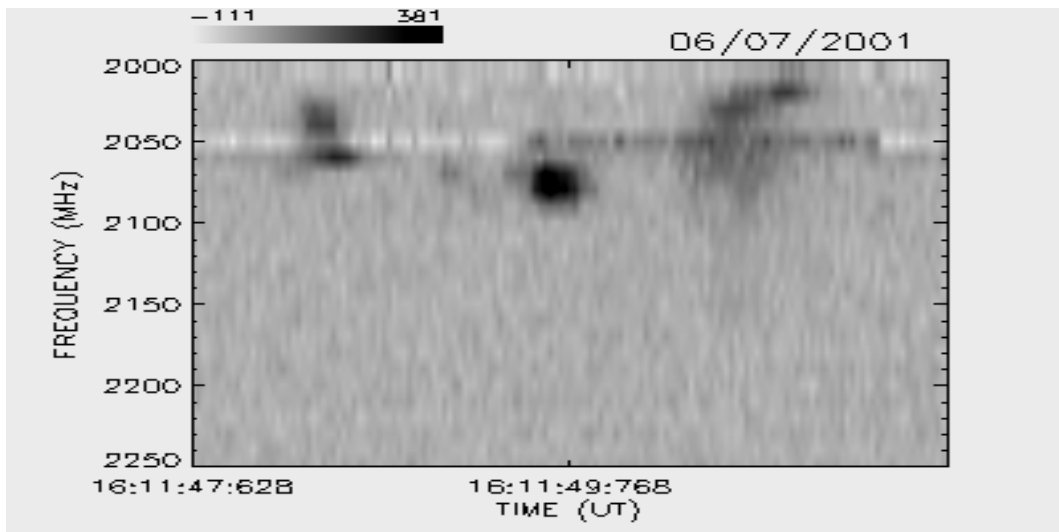
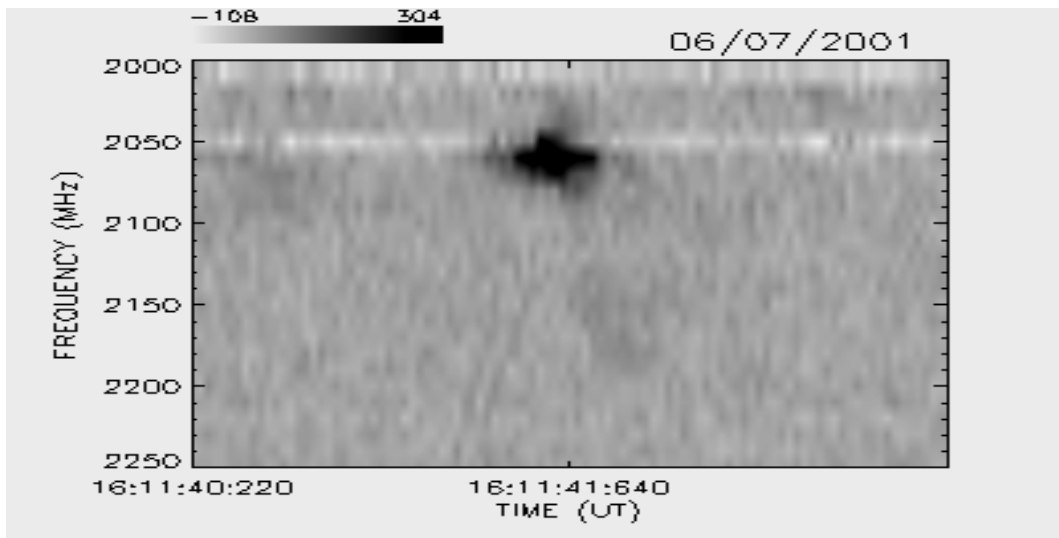
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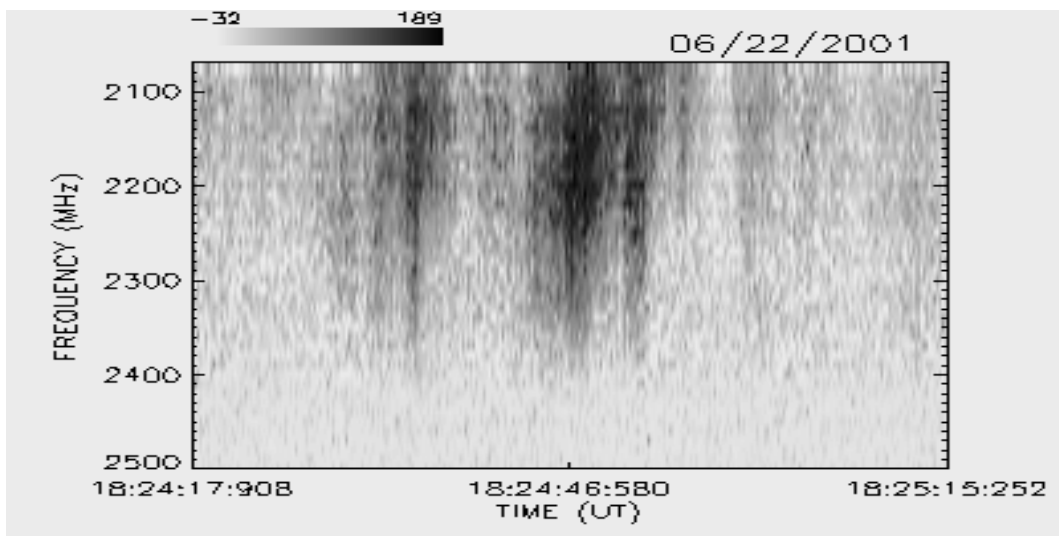
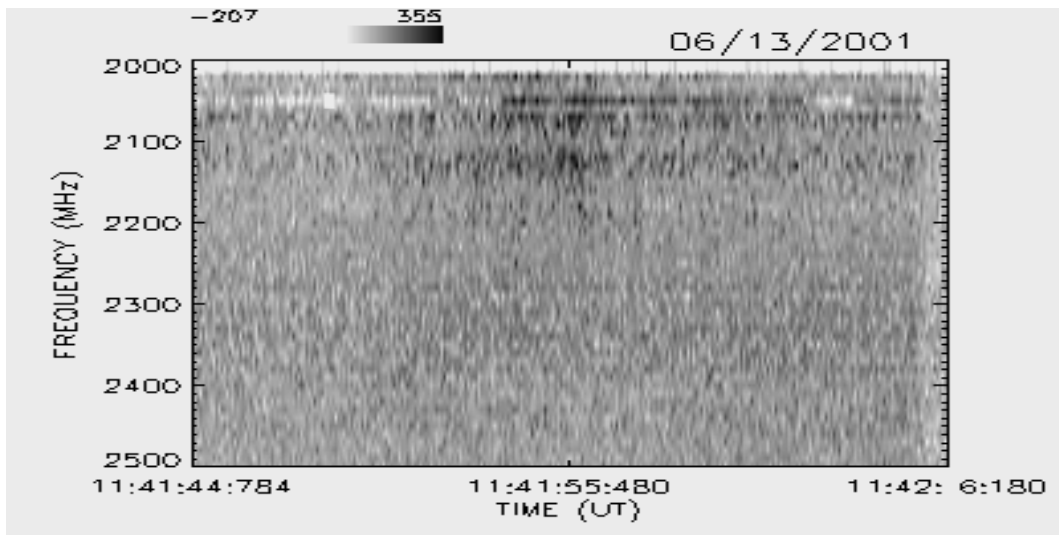
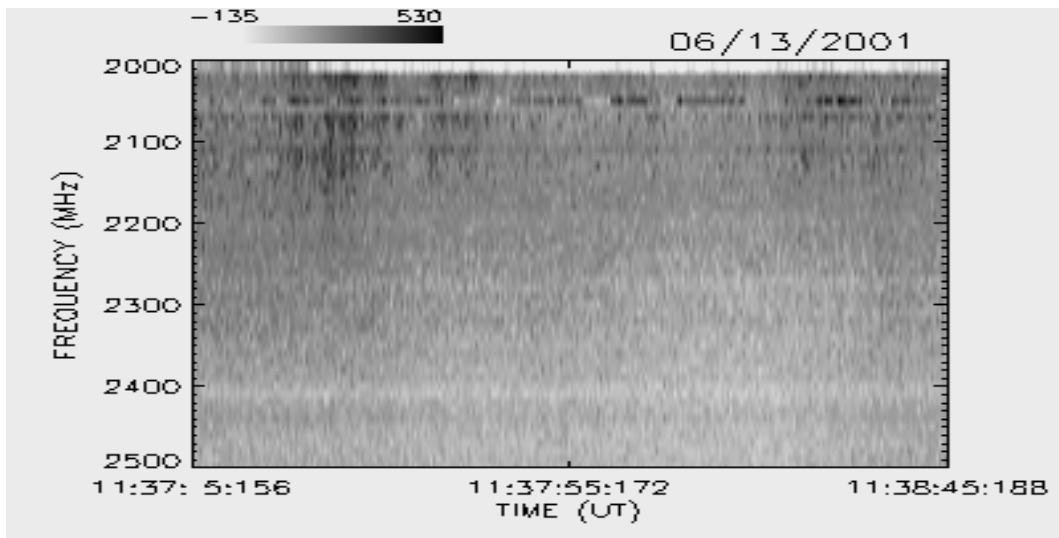
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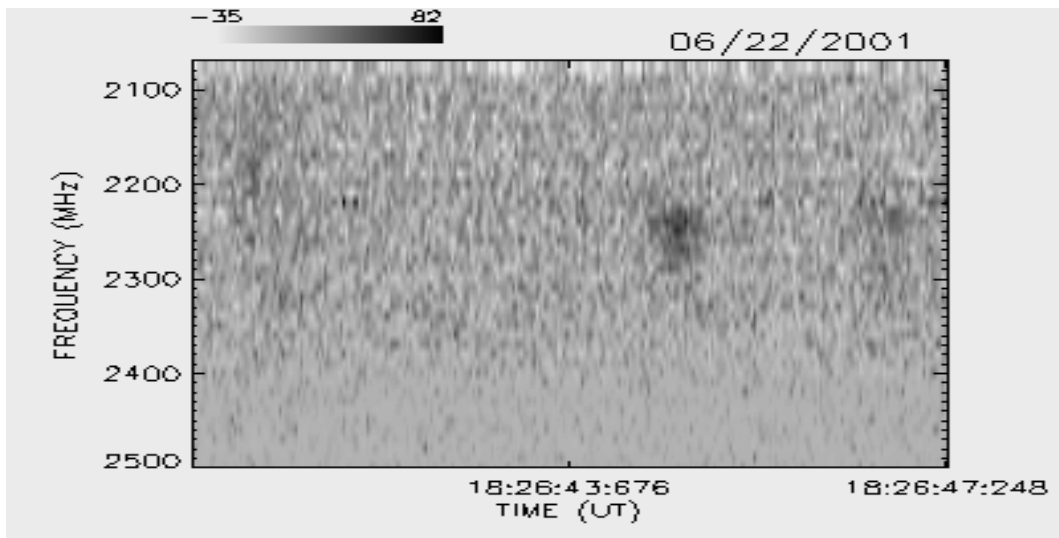
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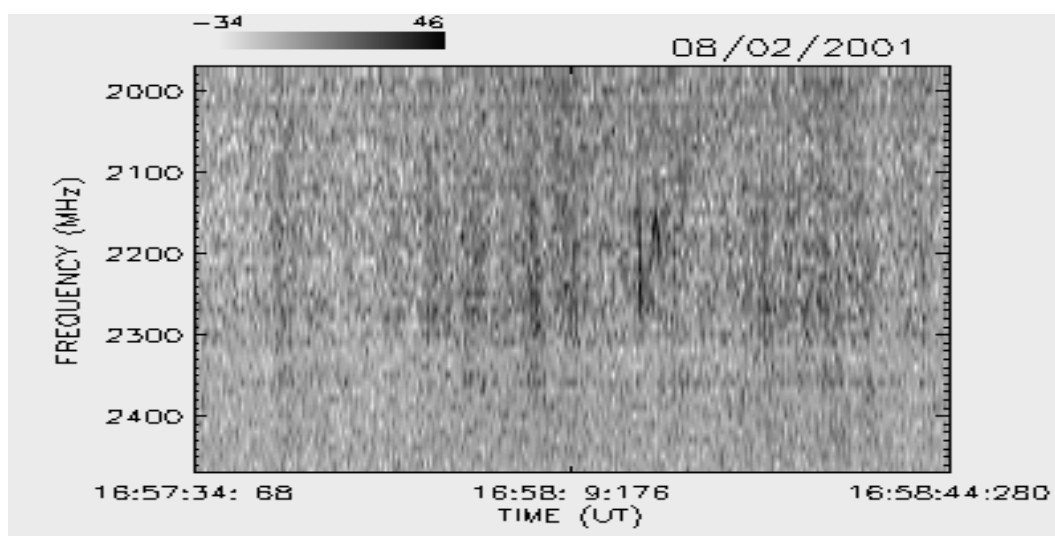
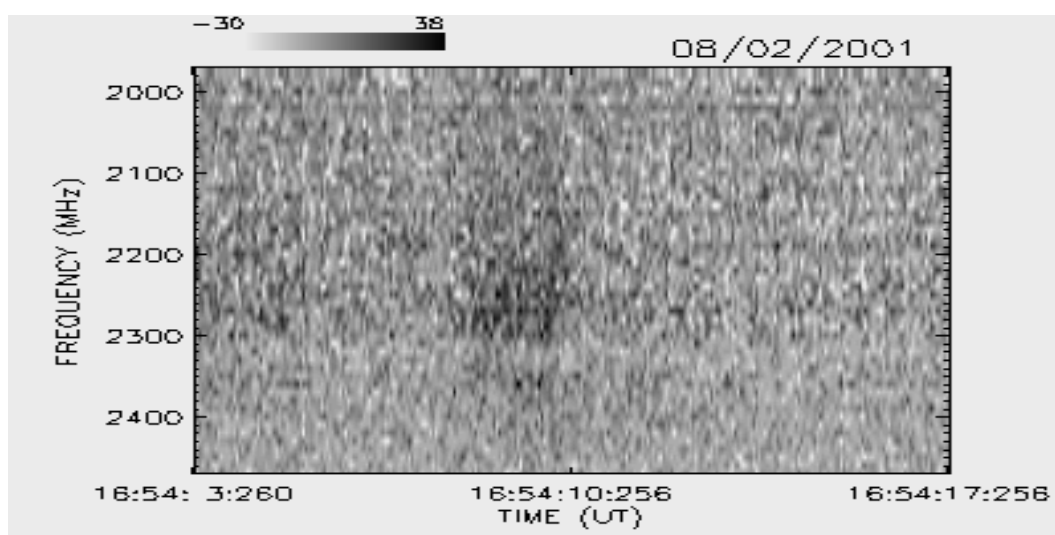
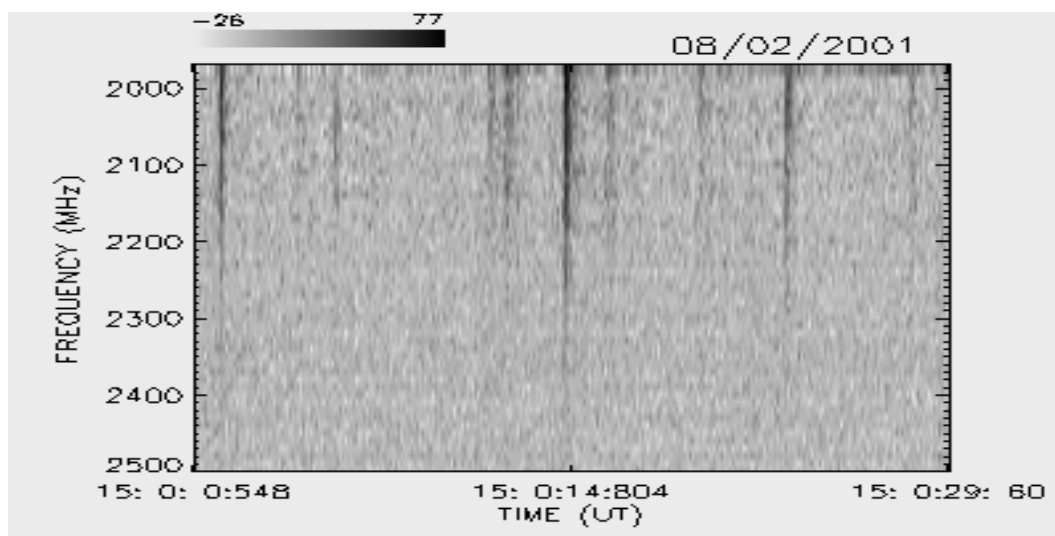
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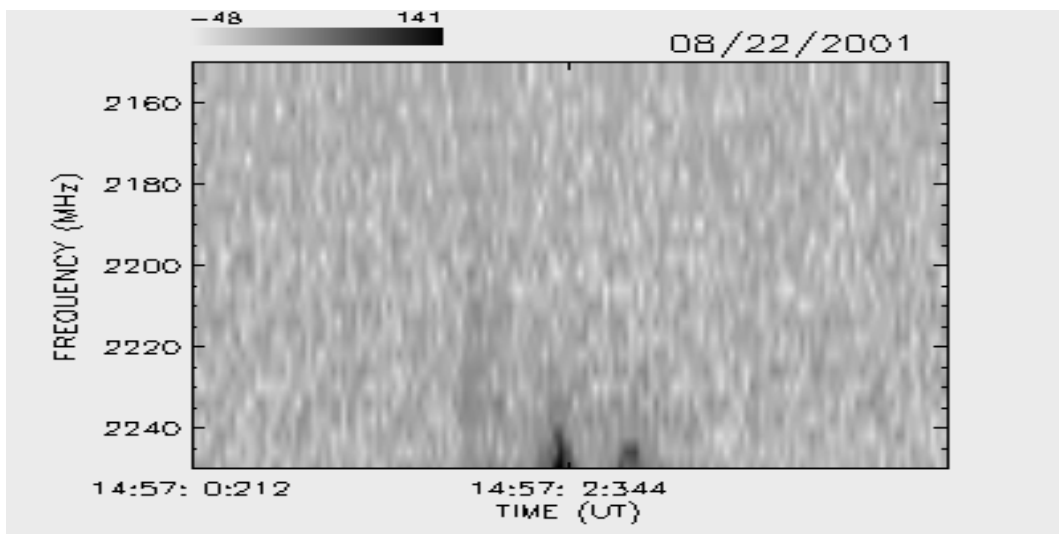
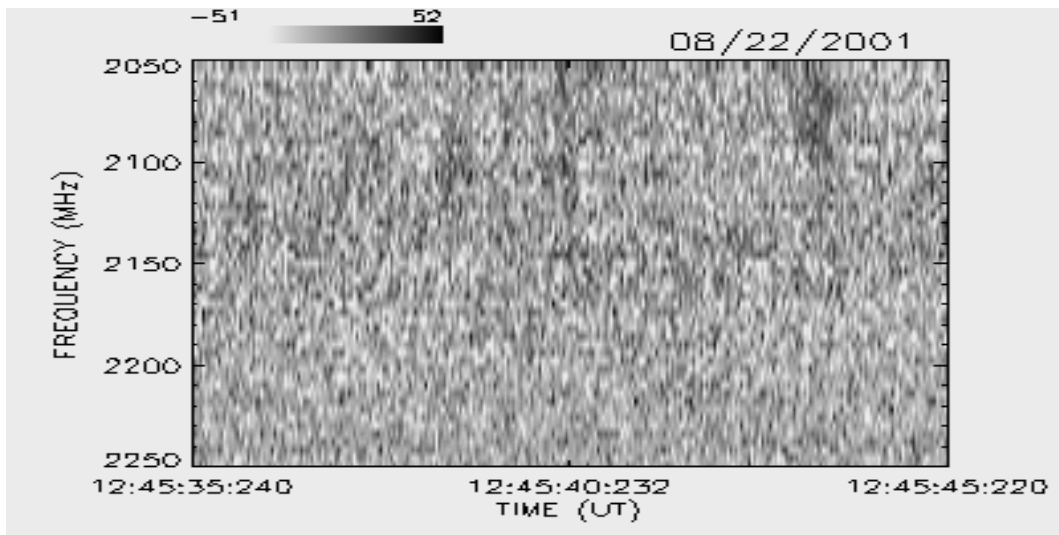
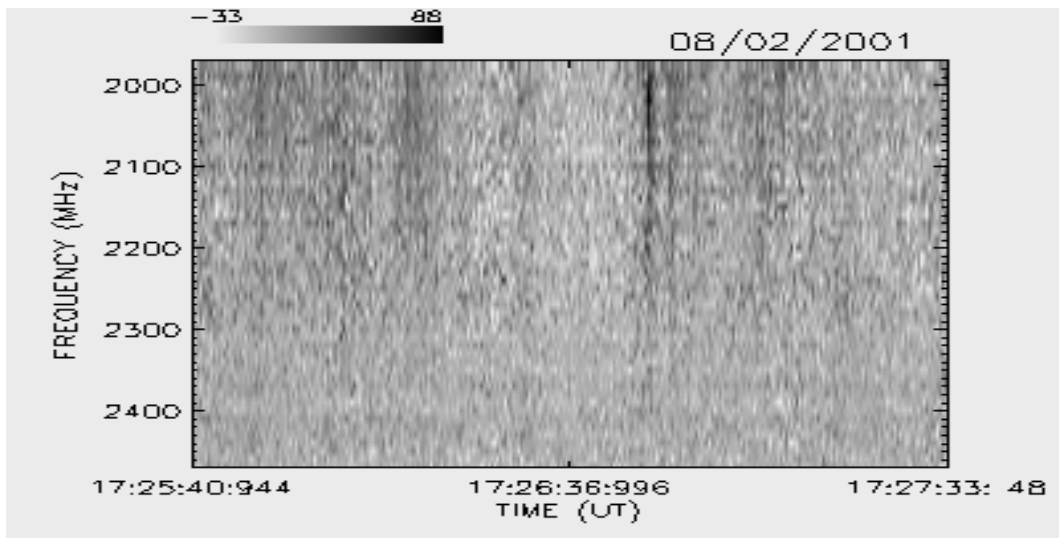
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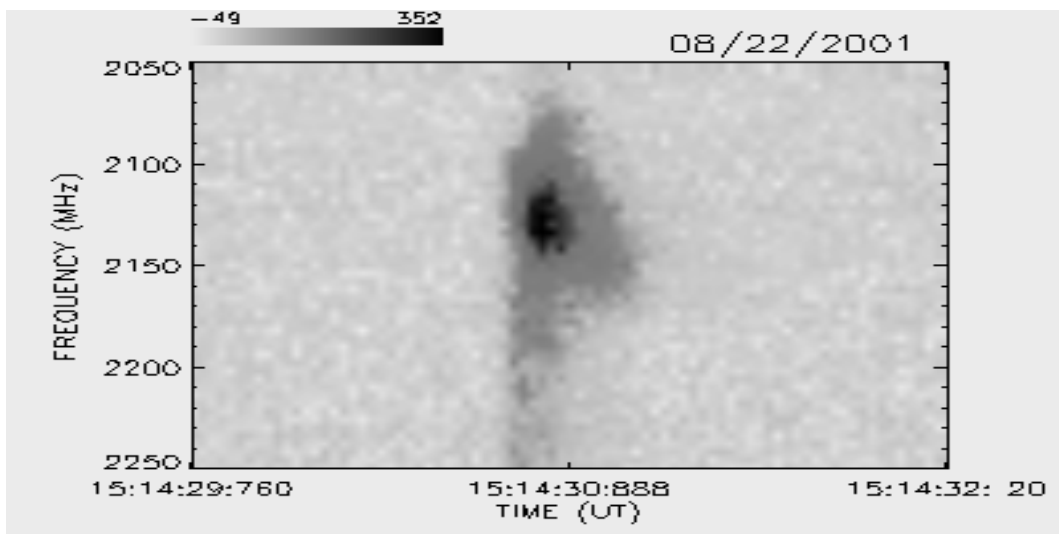
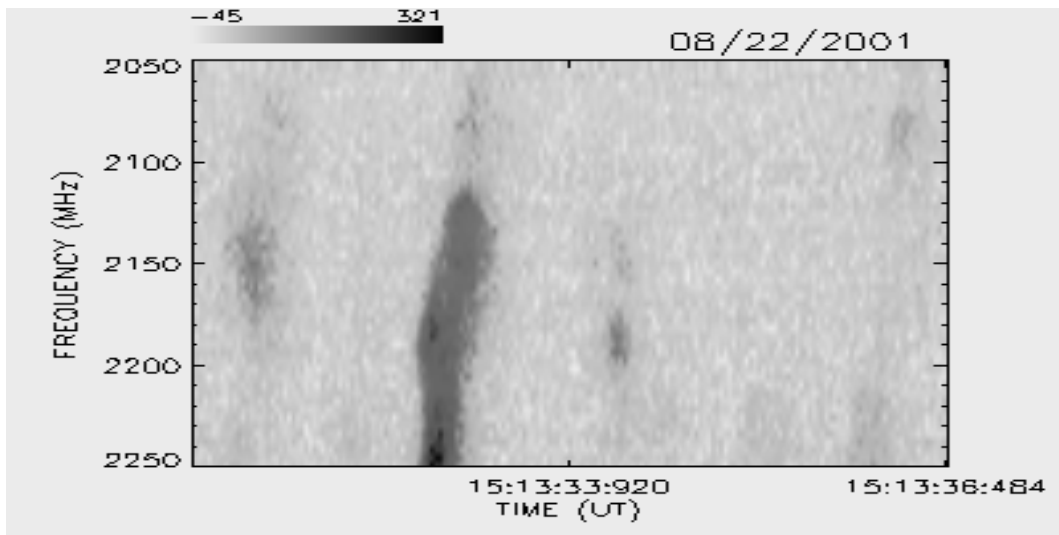
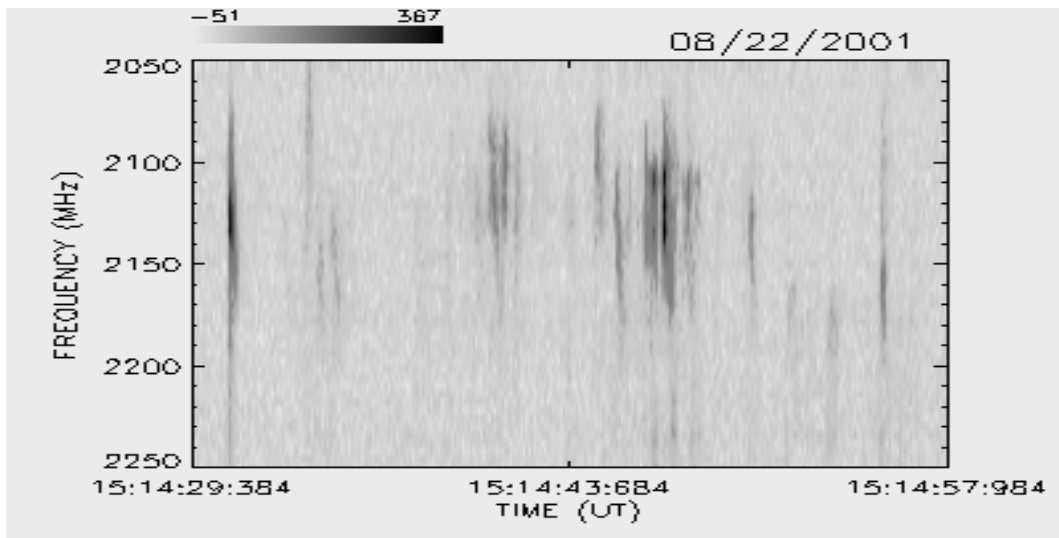
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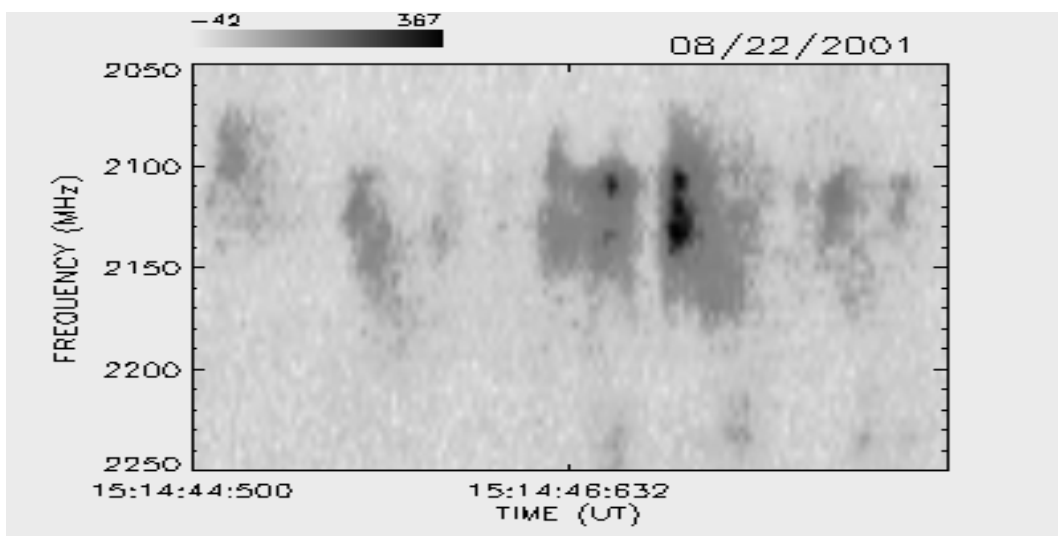
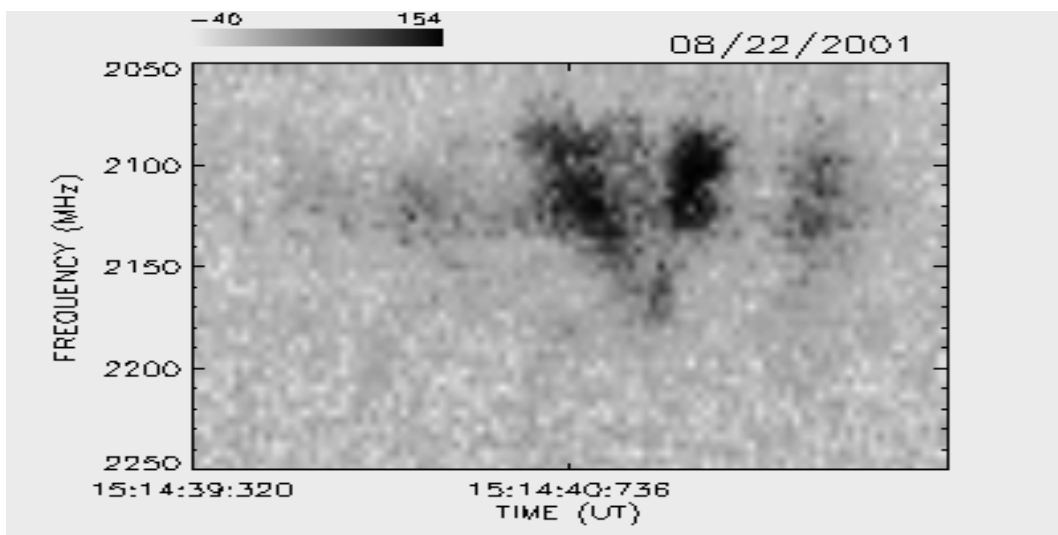
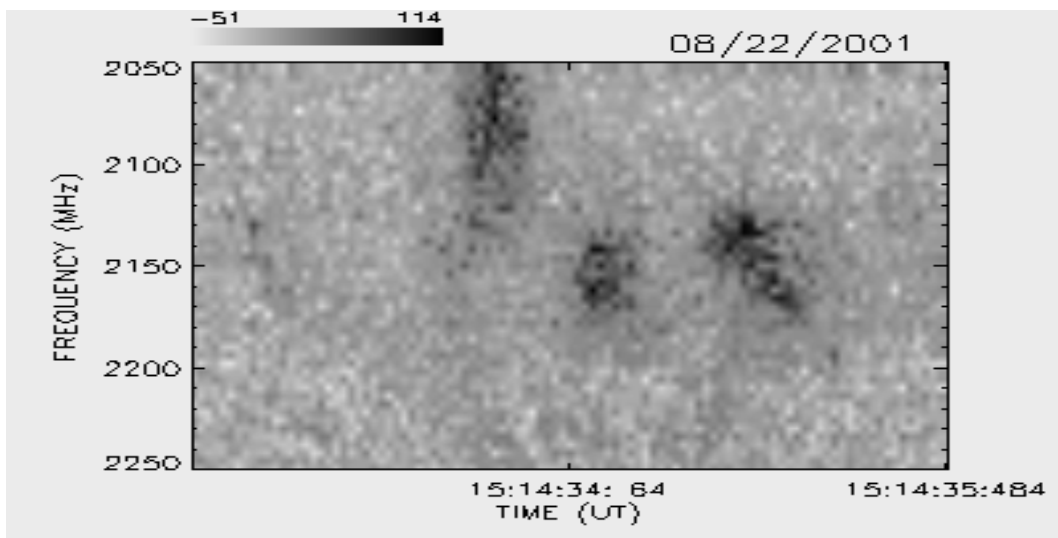
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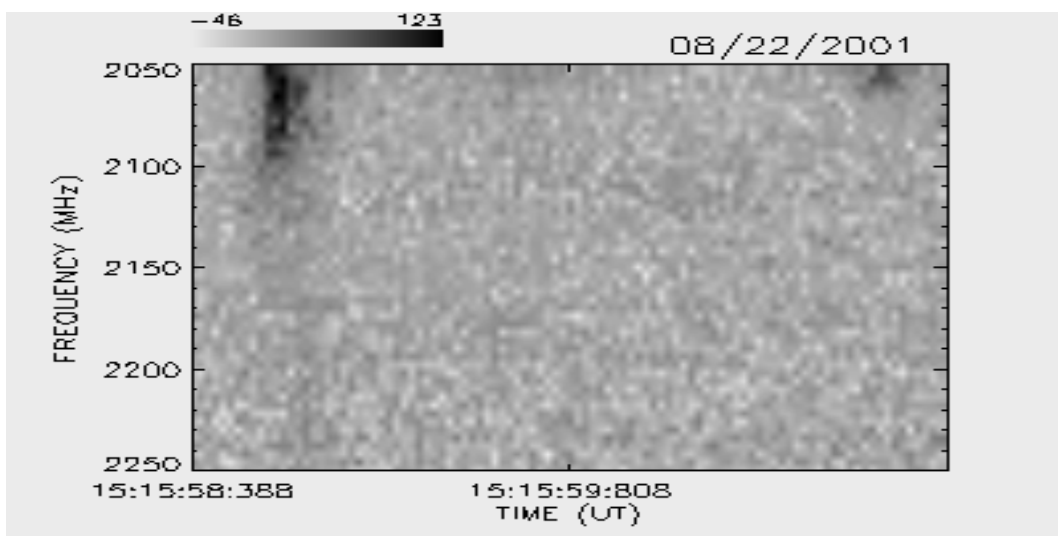
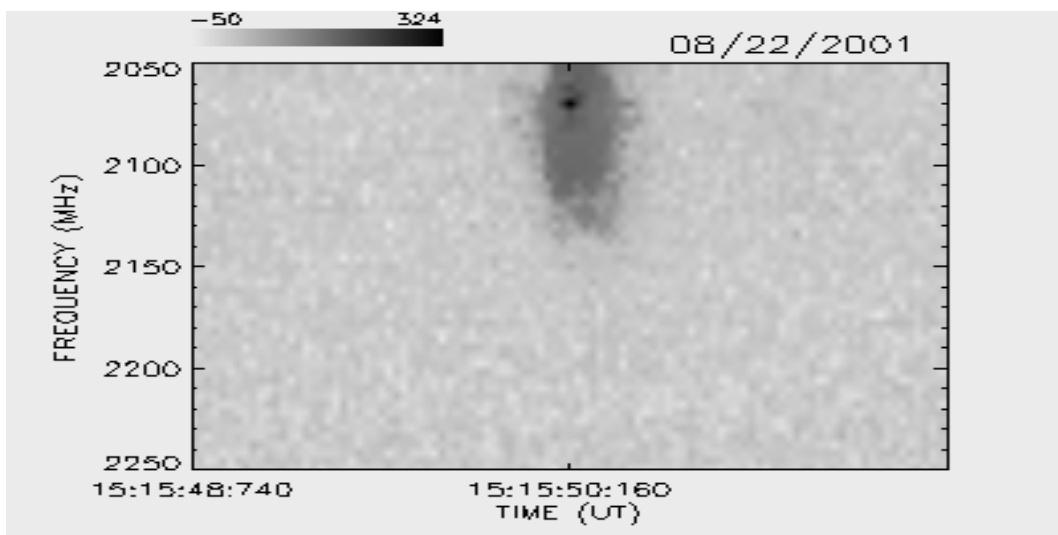
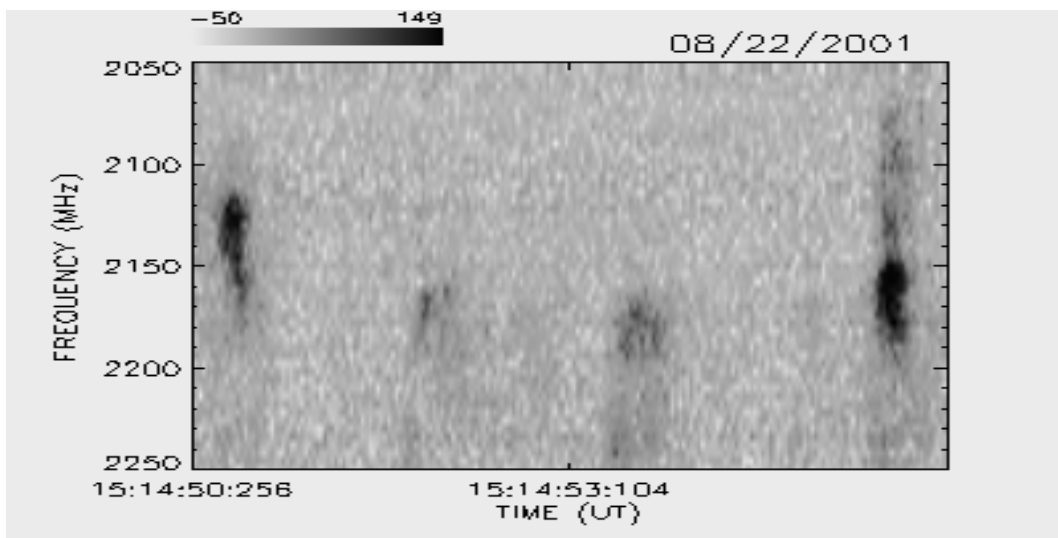
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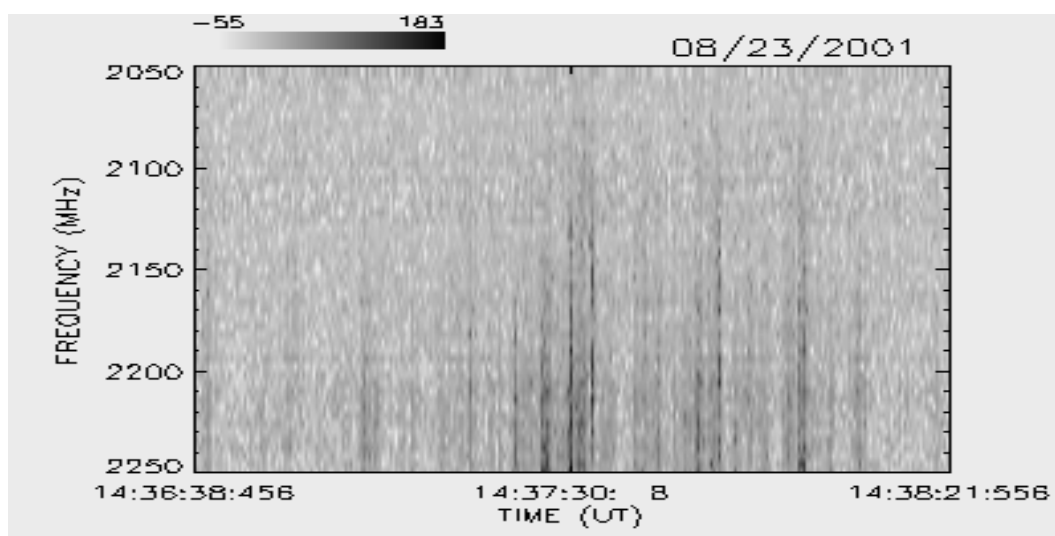
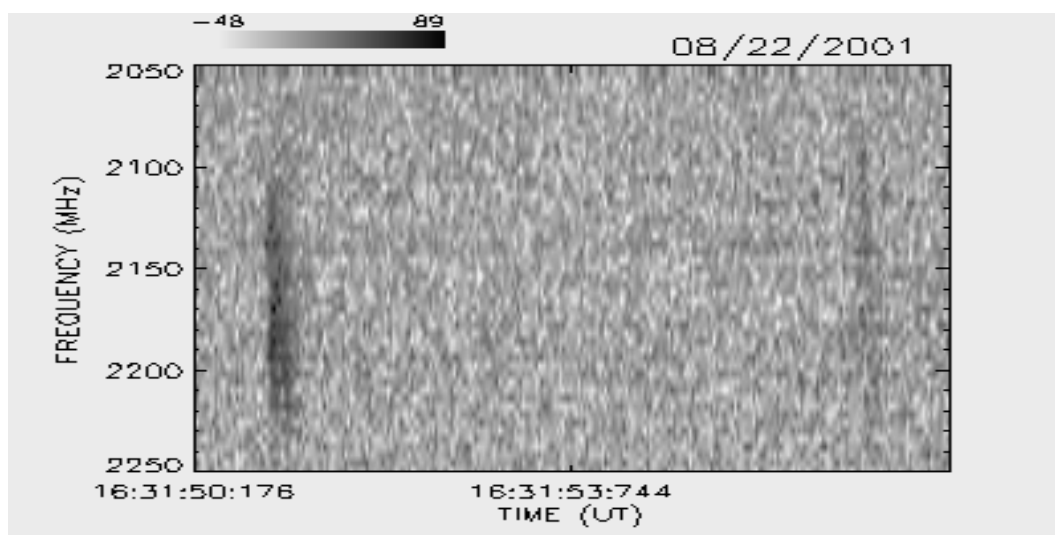
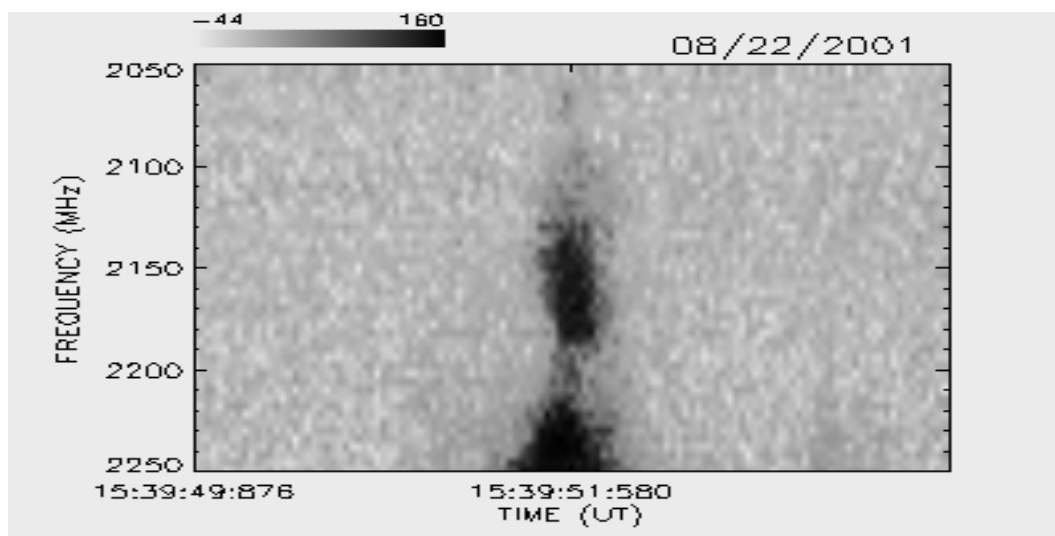
AGOSTO / 2001



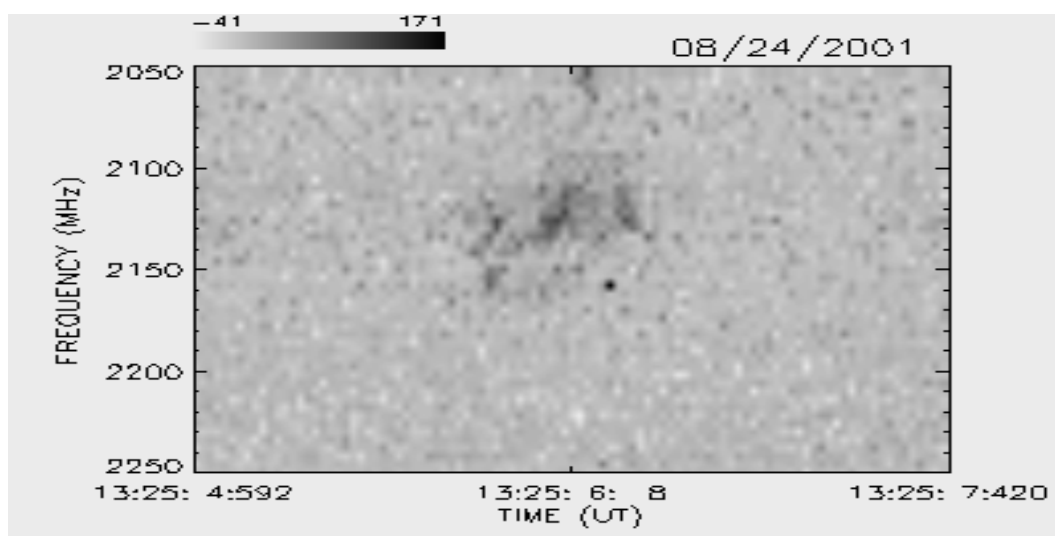
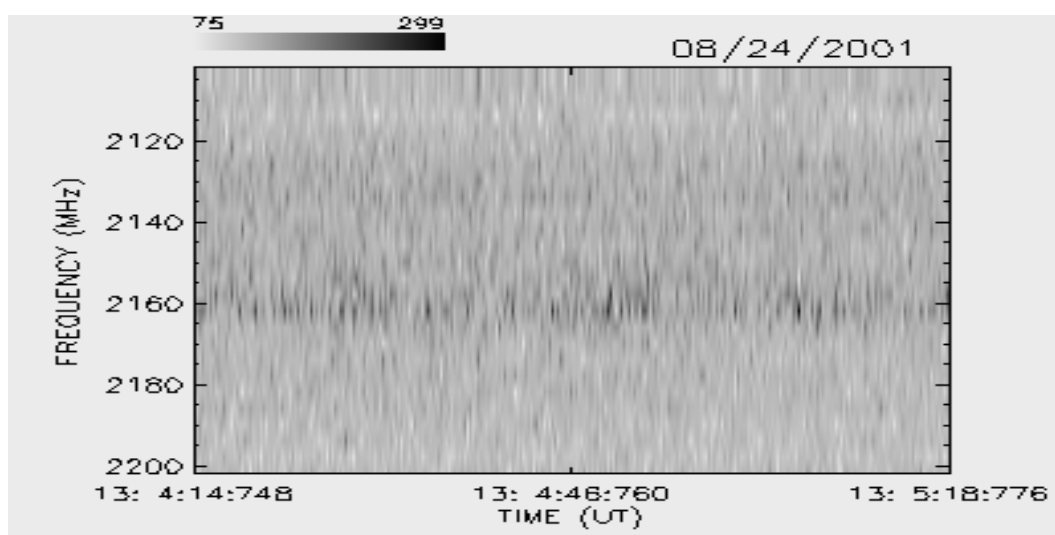
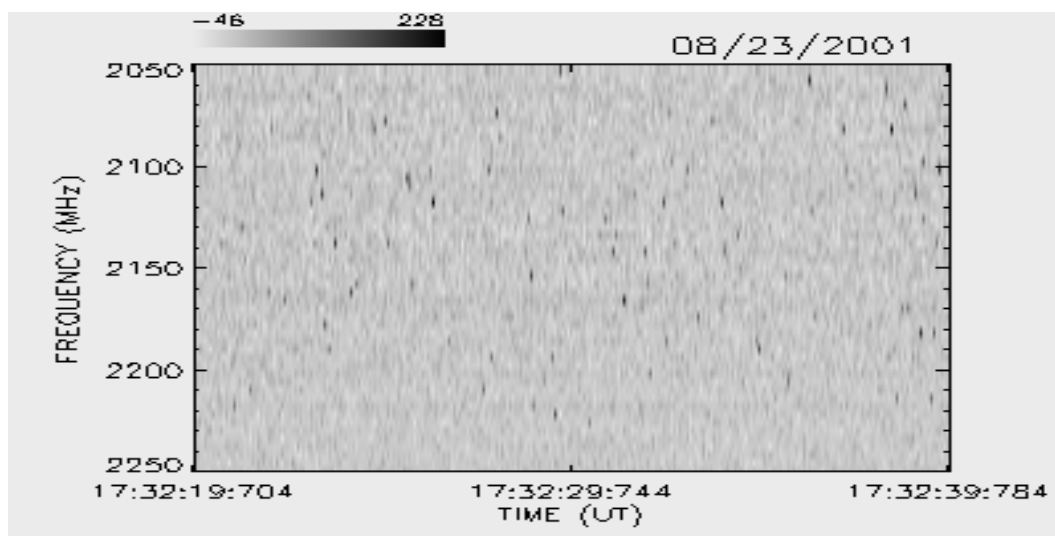
AGOSTO / 2001



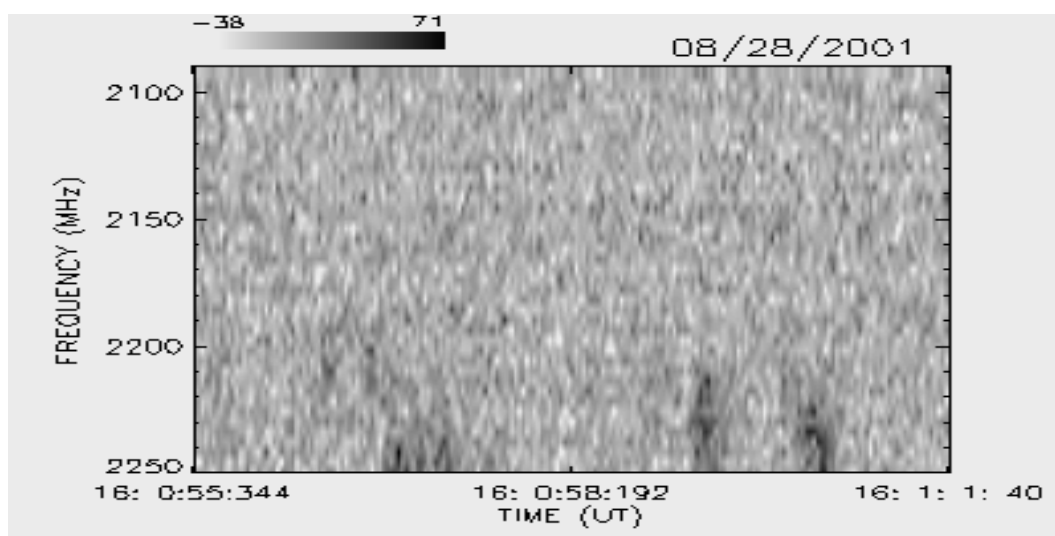
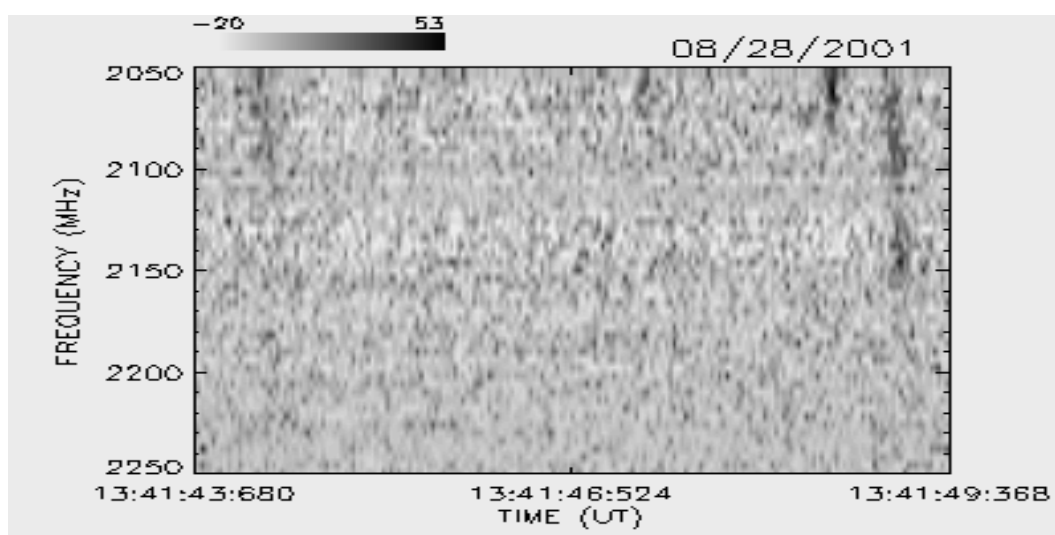
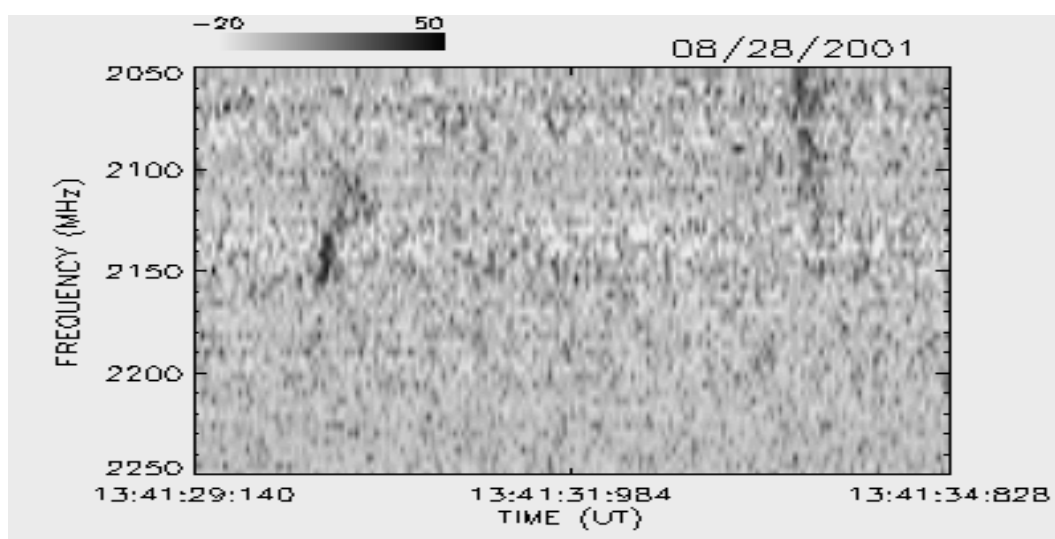
AGOSTO / 2001



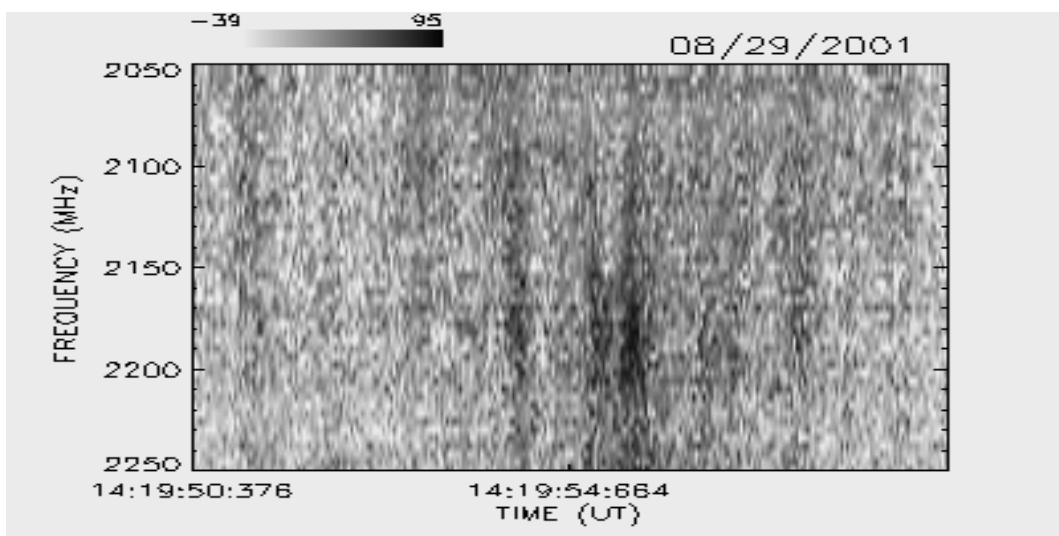
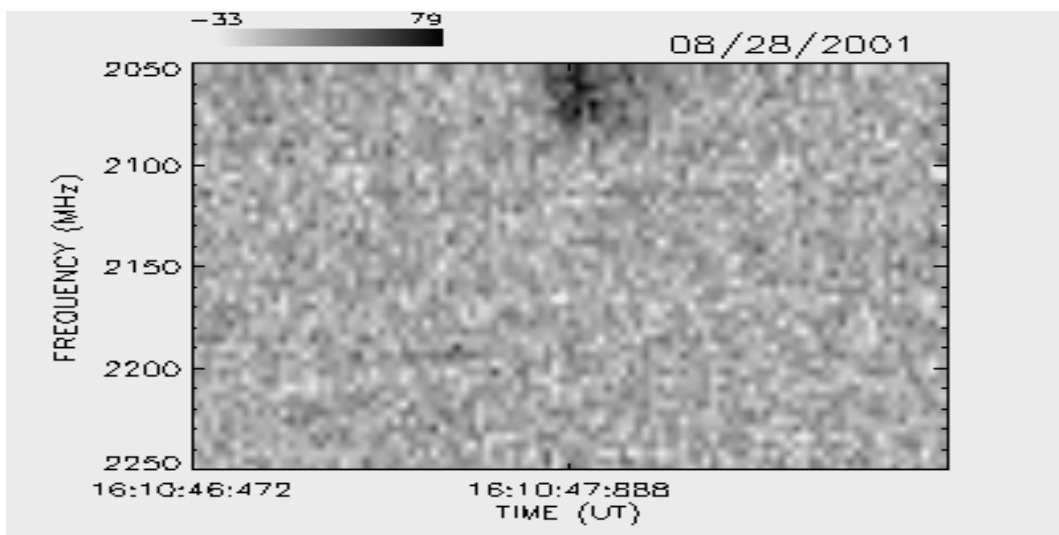
AGOSTO / 2001



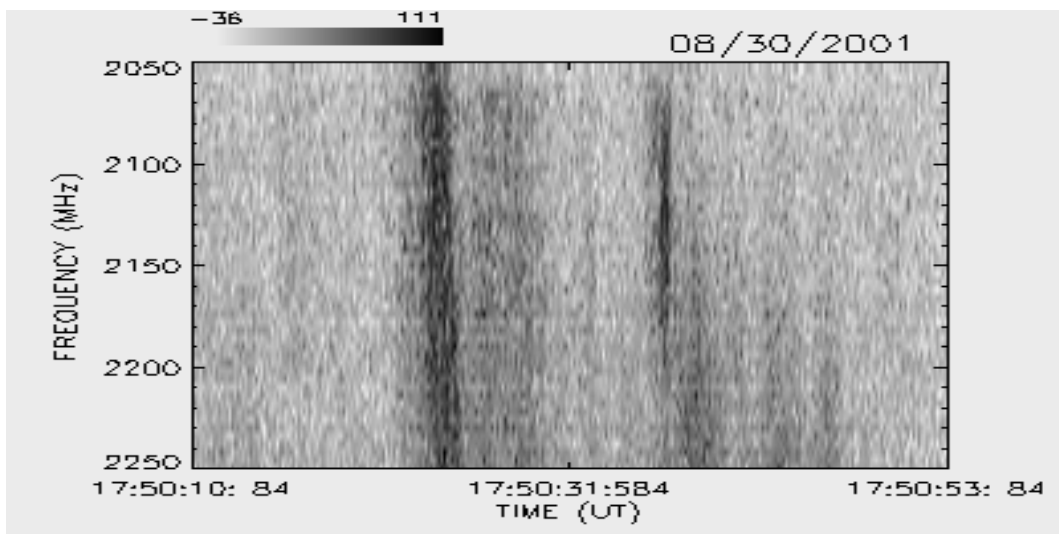
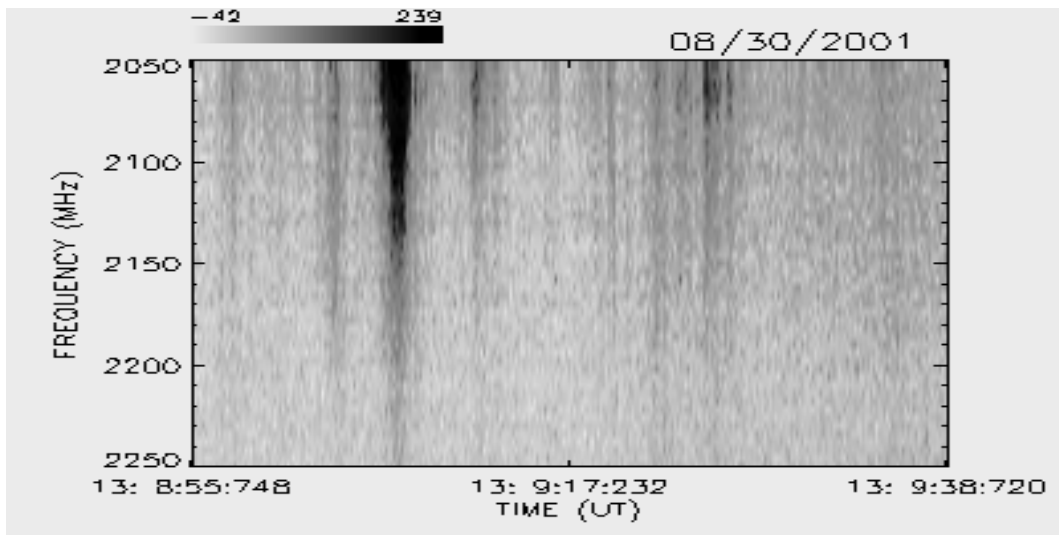
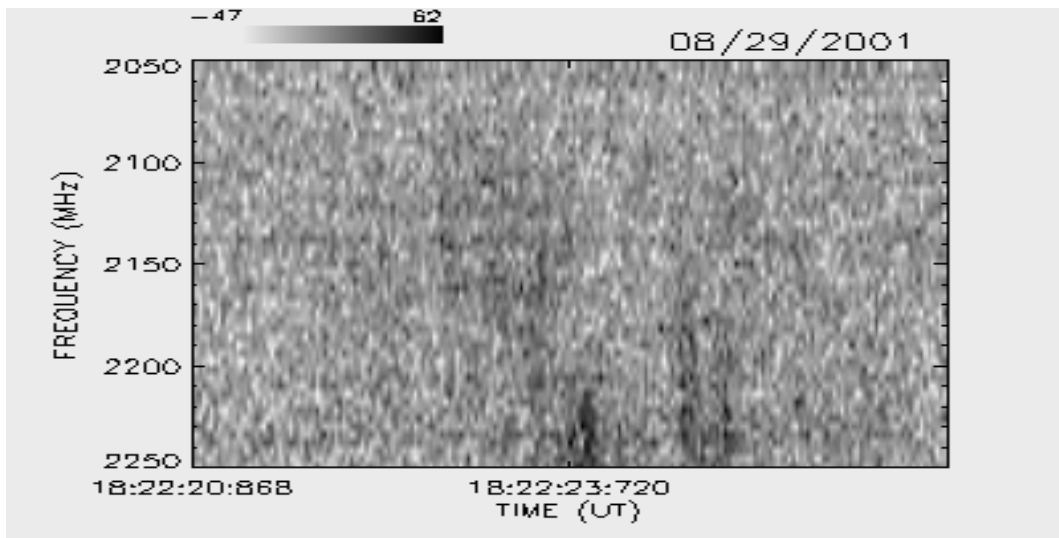
AGOSTO / 2001



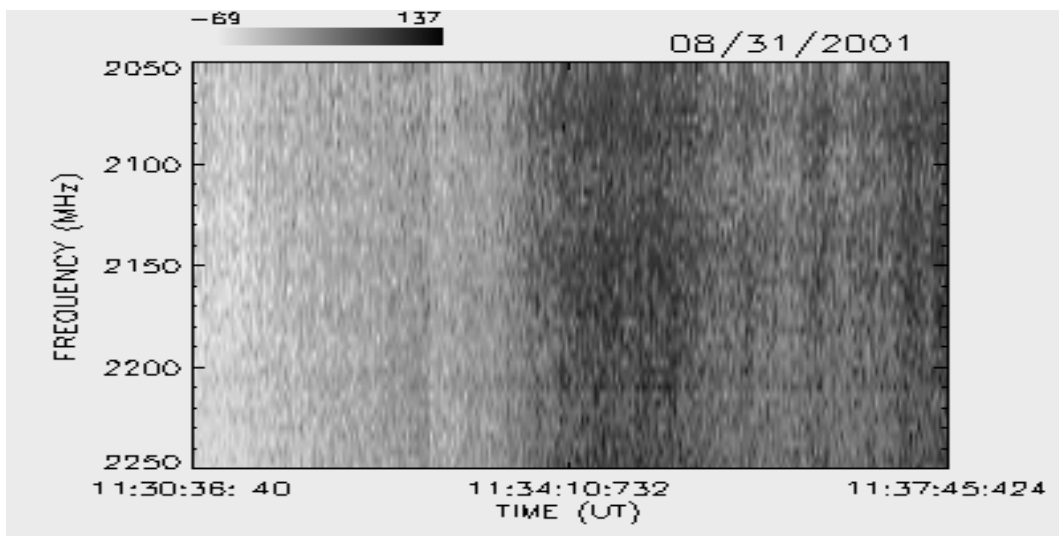
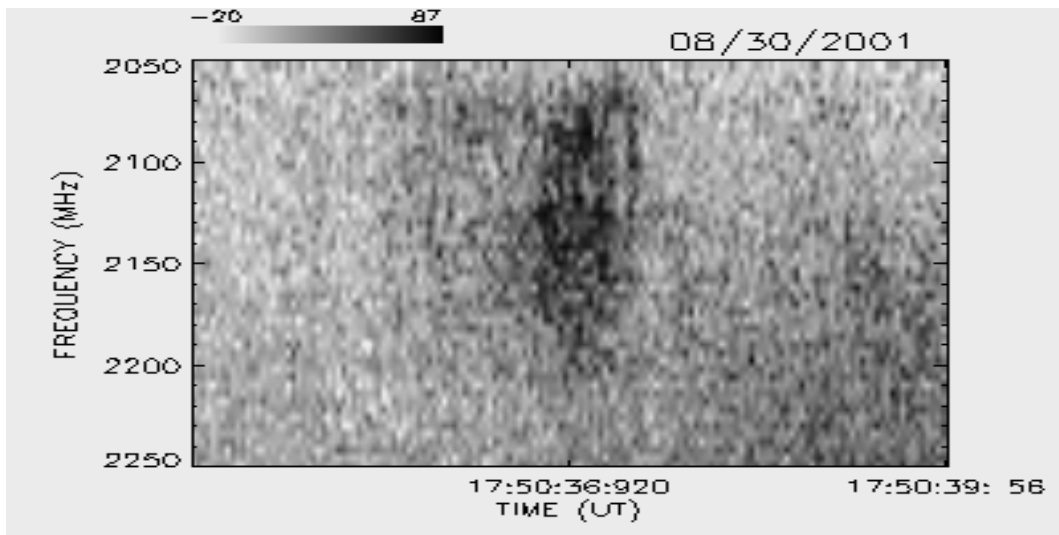
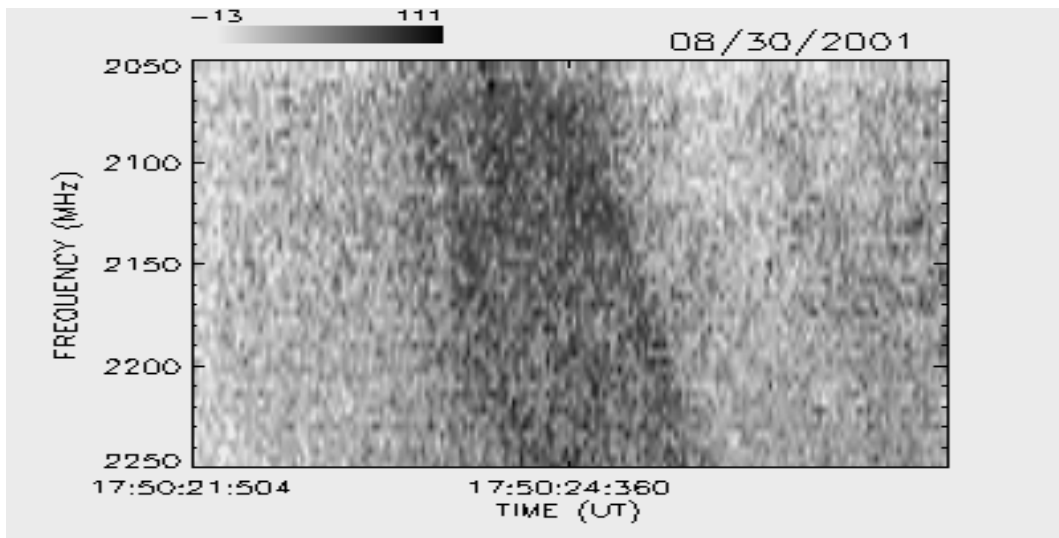
AGOSTO / 2001



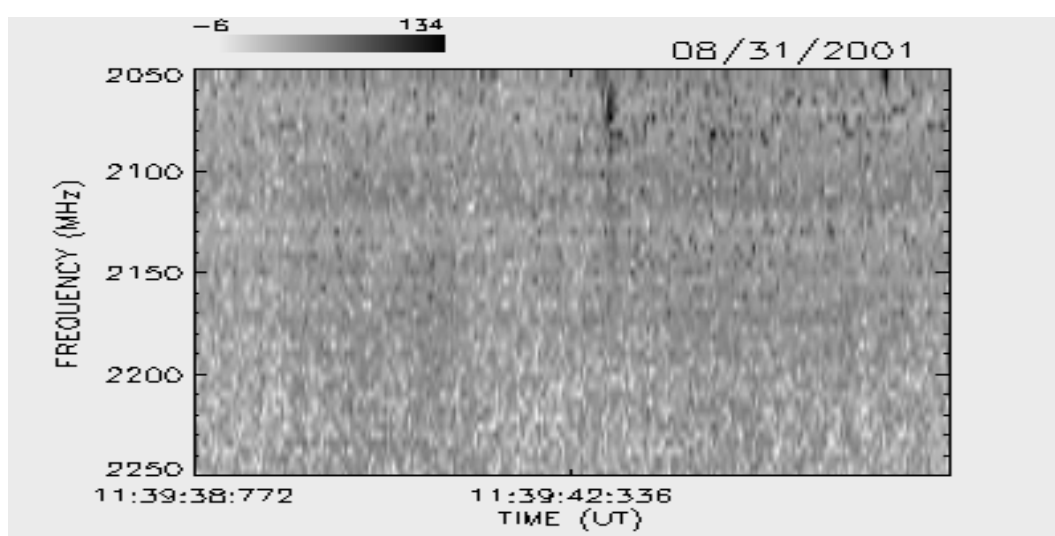
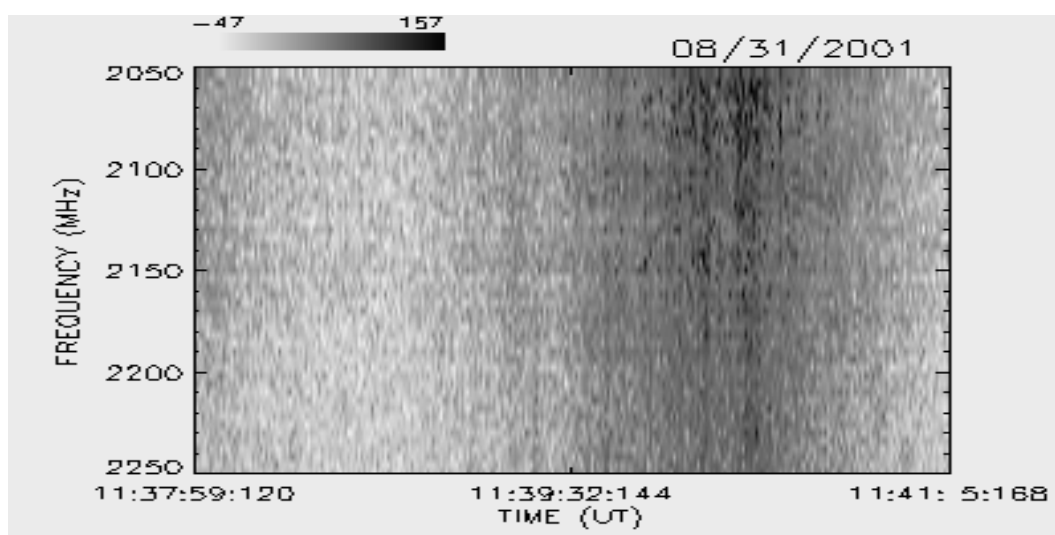
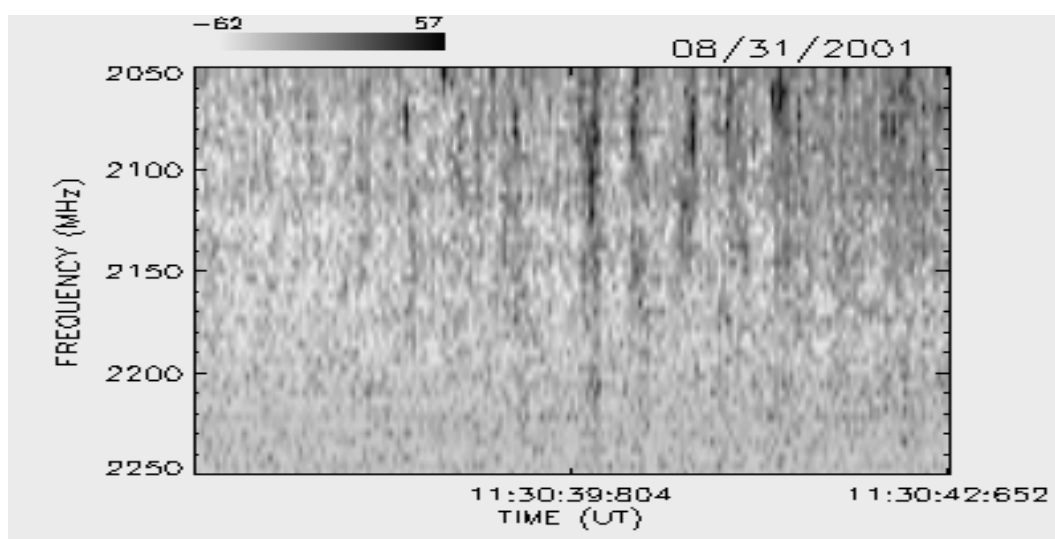
AGOSTO / 2001



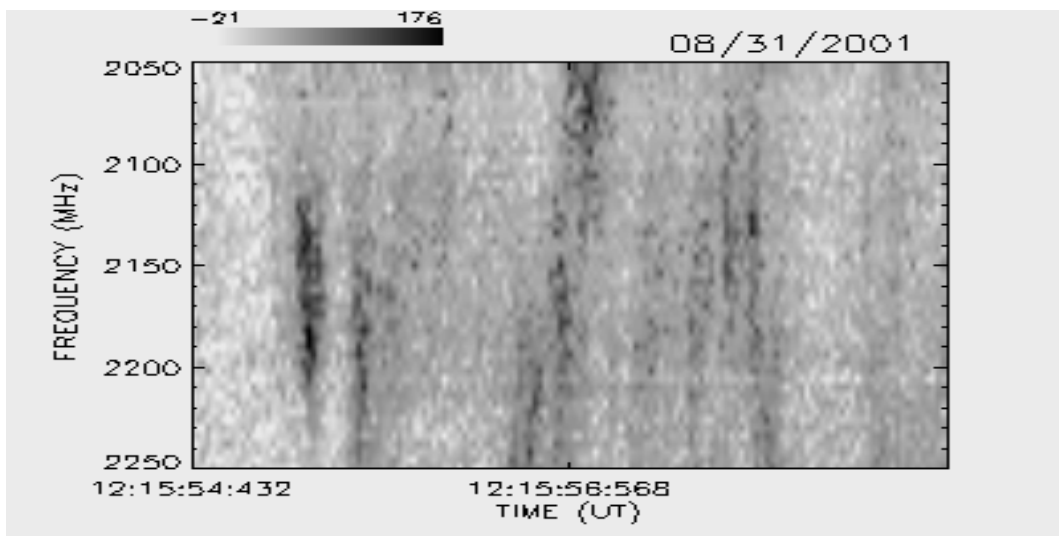
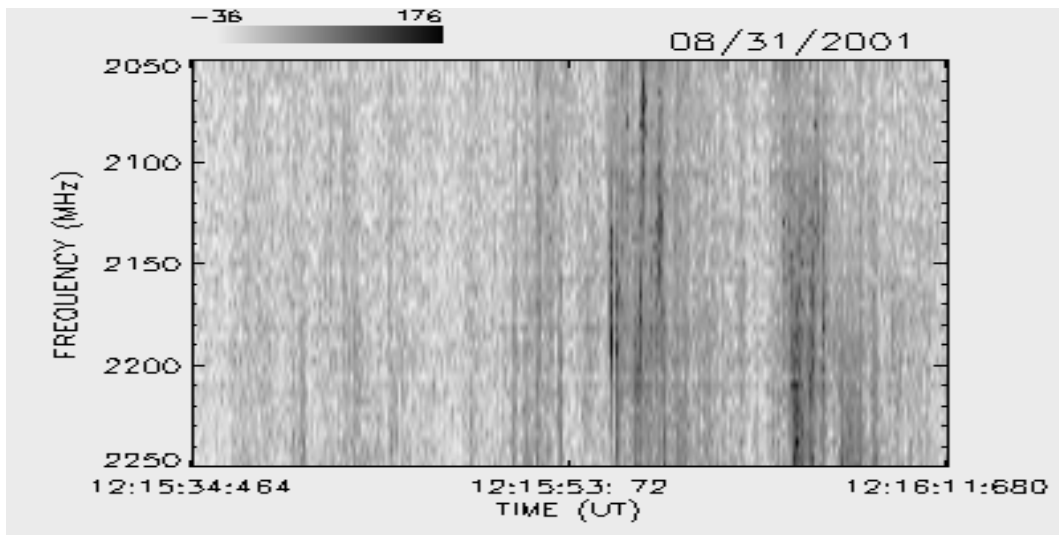
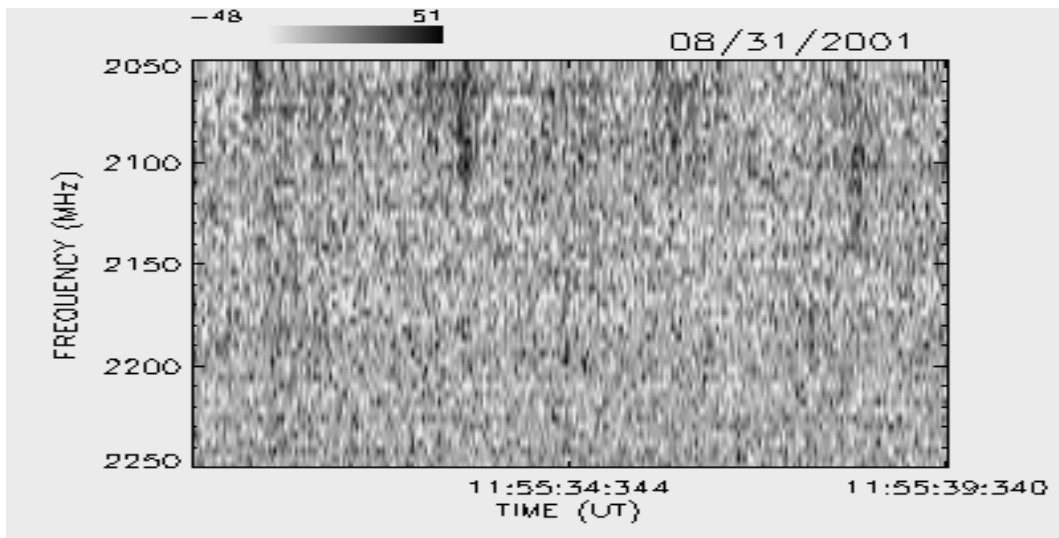
AGOSTO / 2001



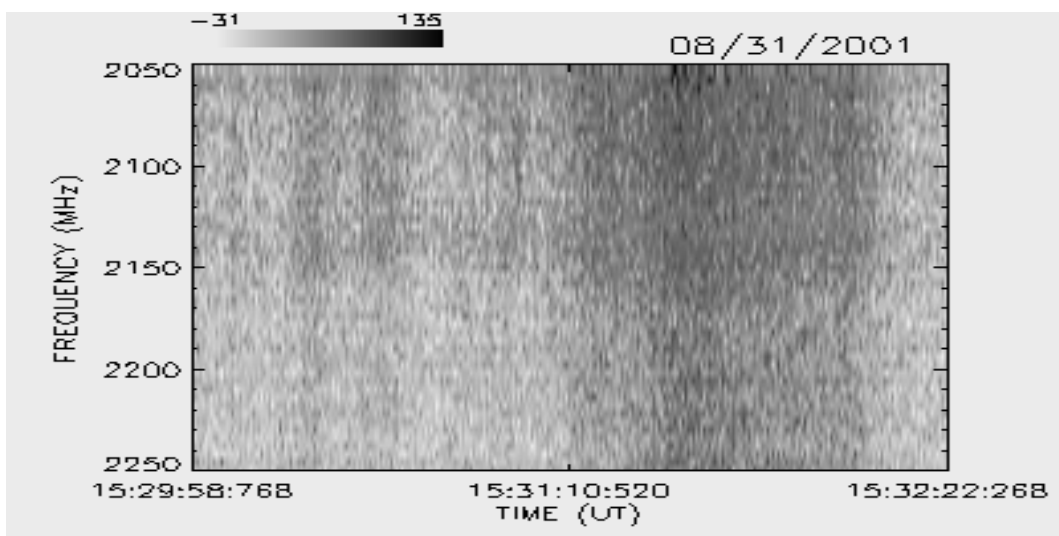
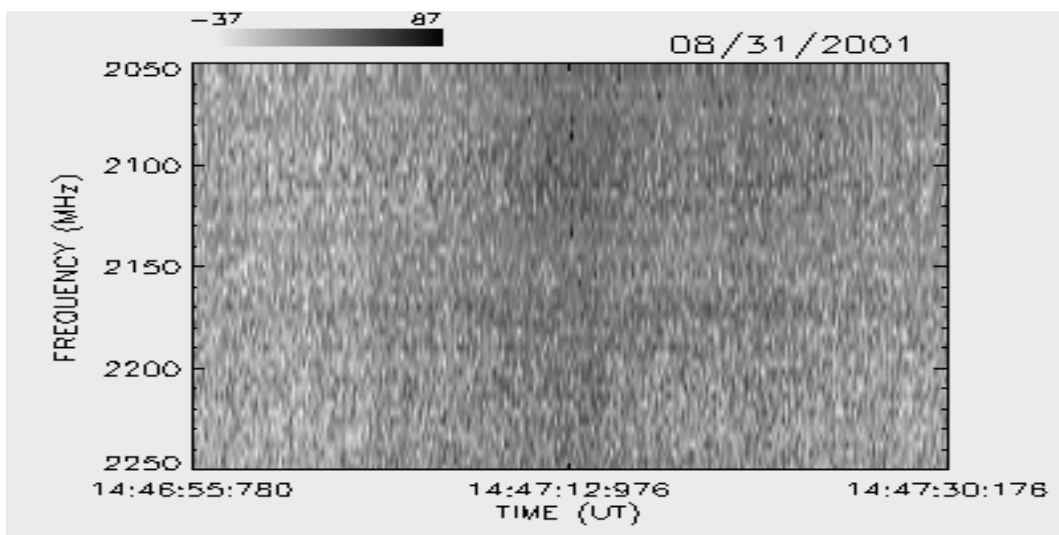
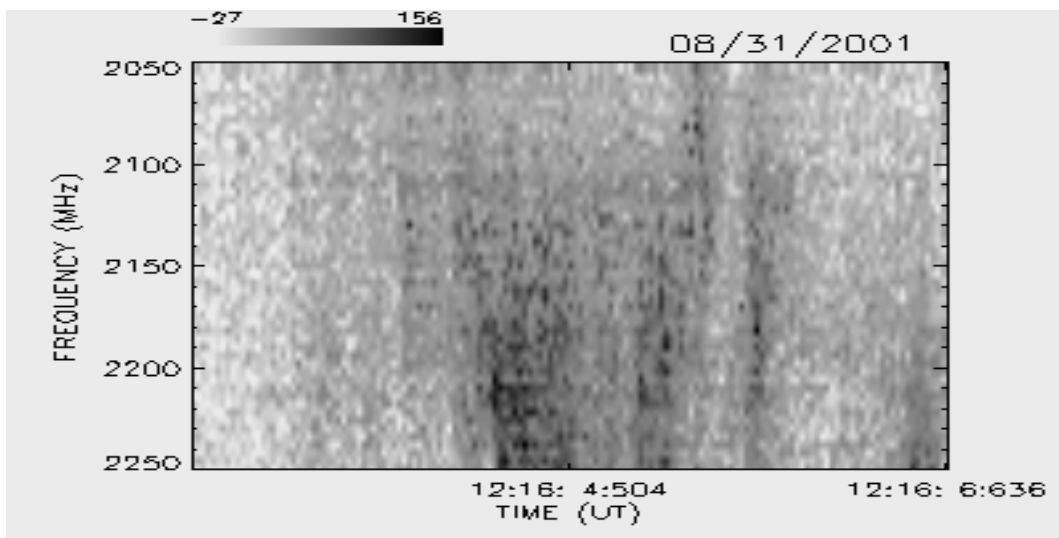
AGOSTO / 2001



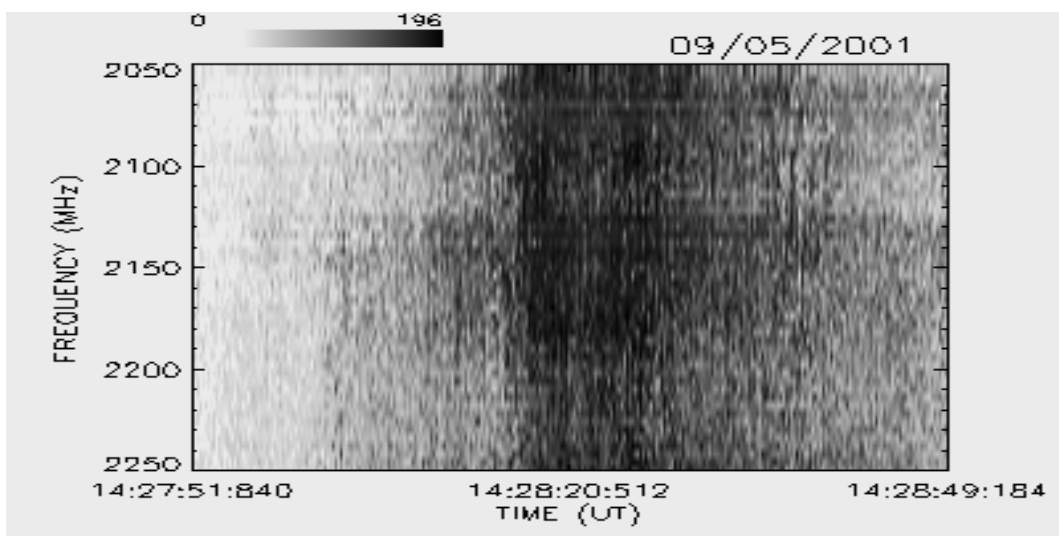
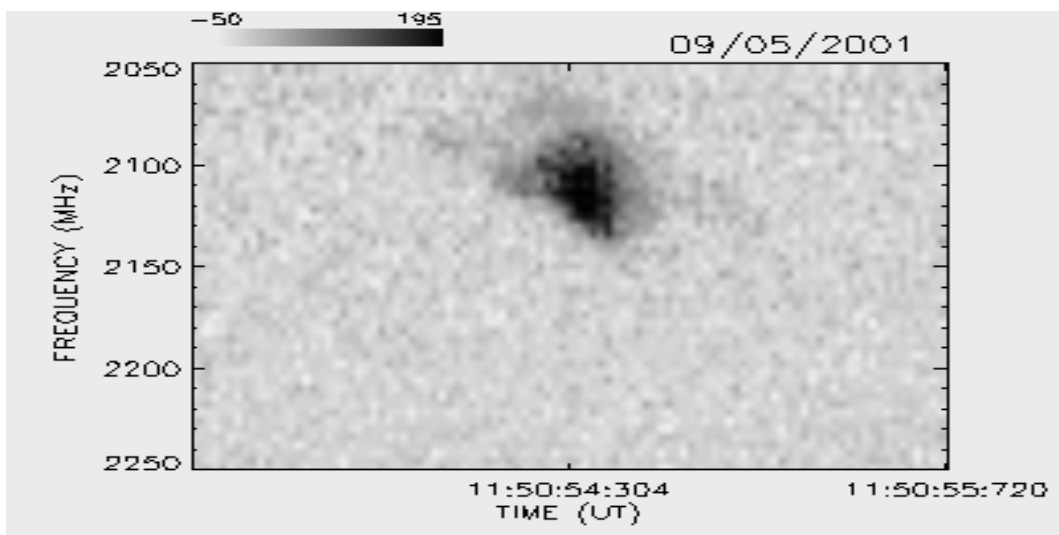
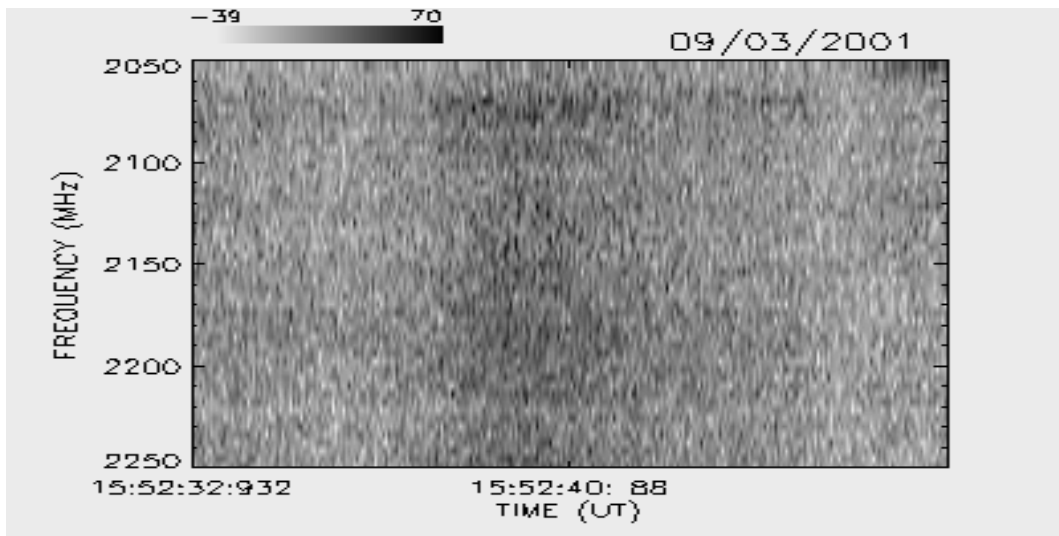
AGOSTO / 2001



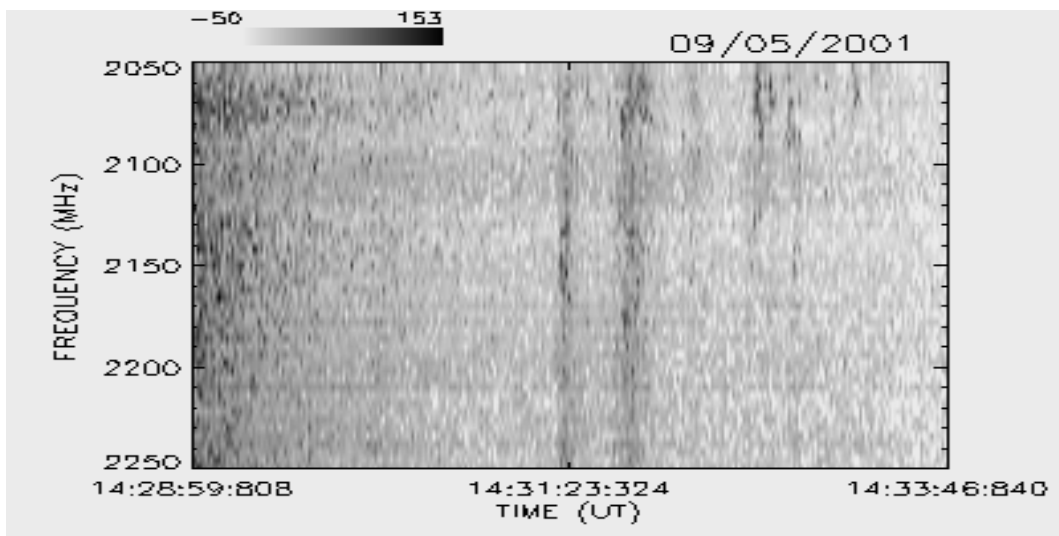
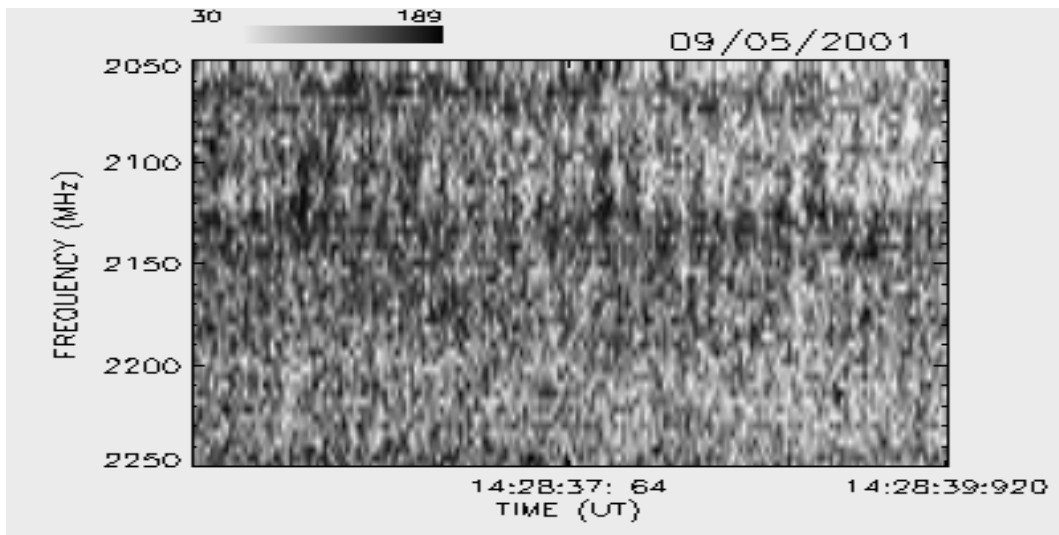
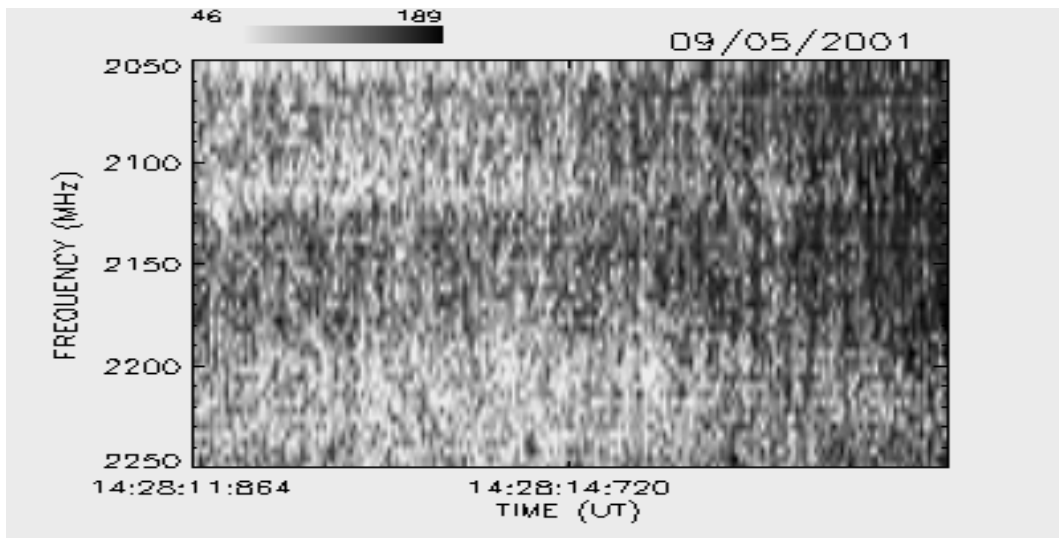
AGOSTO / 2001



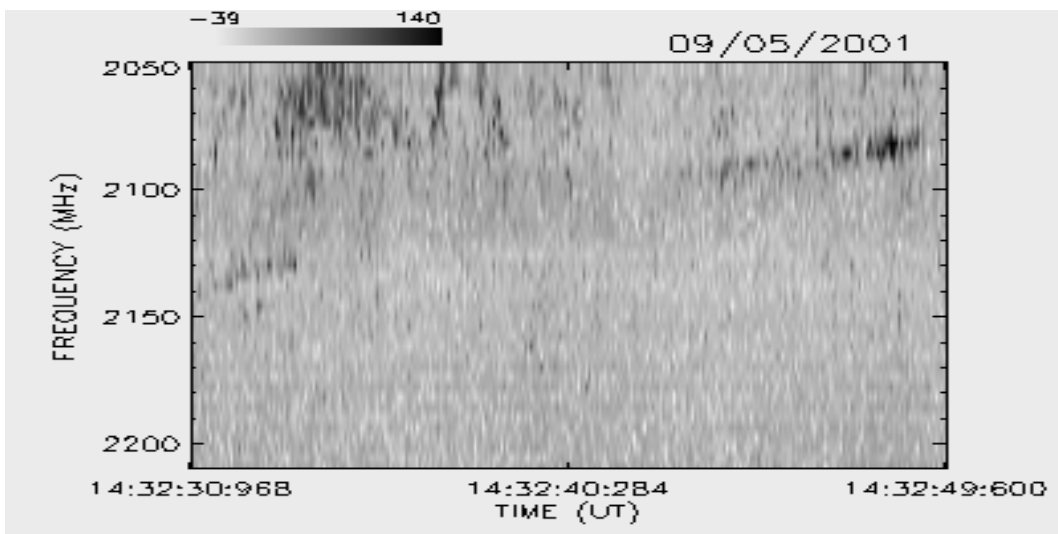
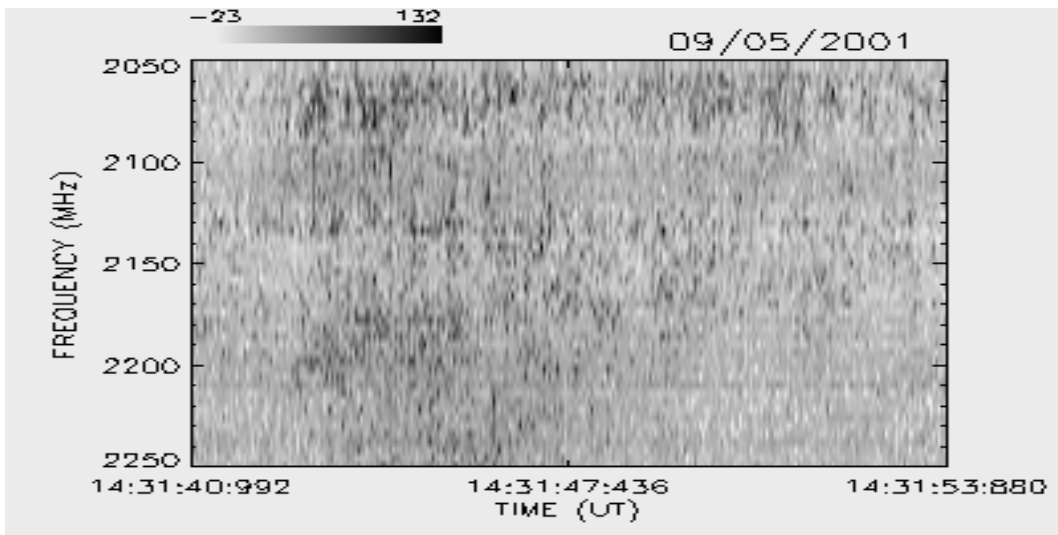
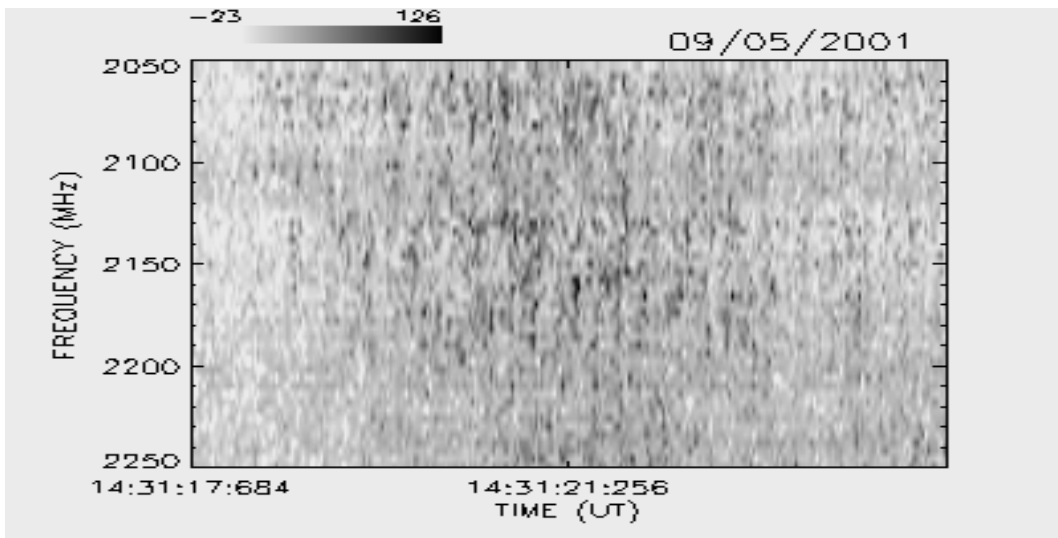
SETEMBRO / 2001



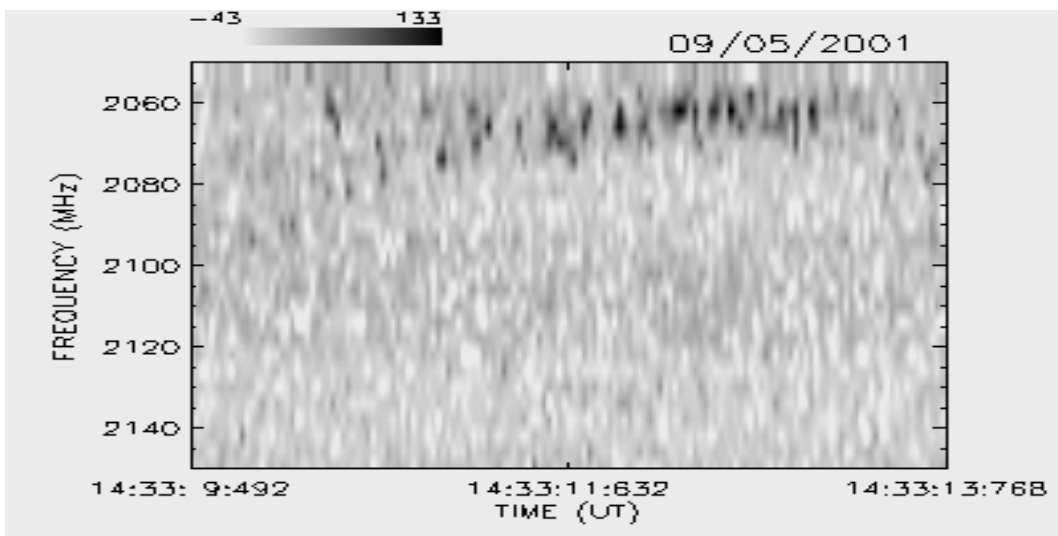
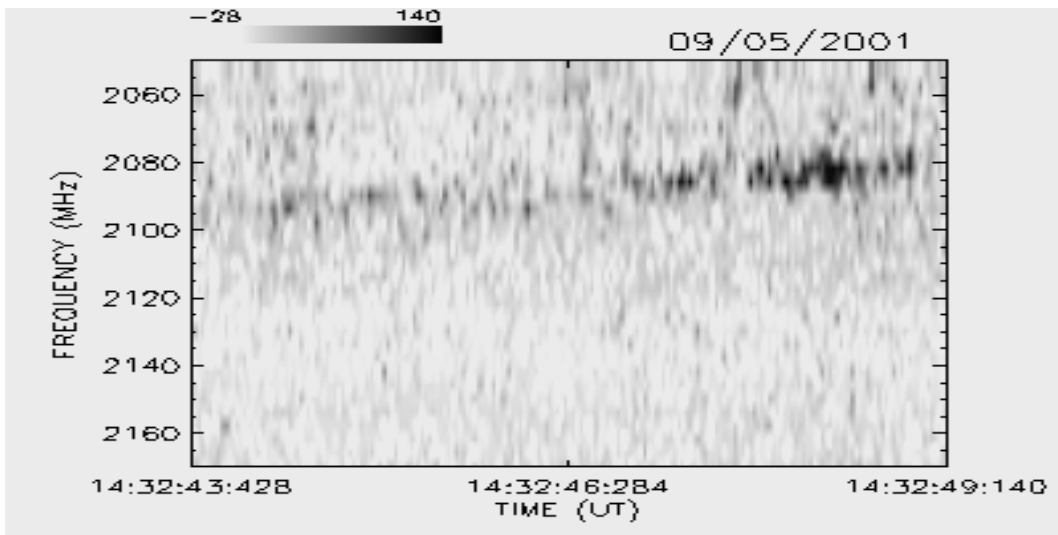
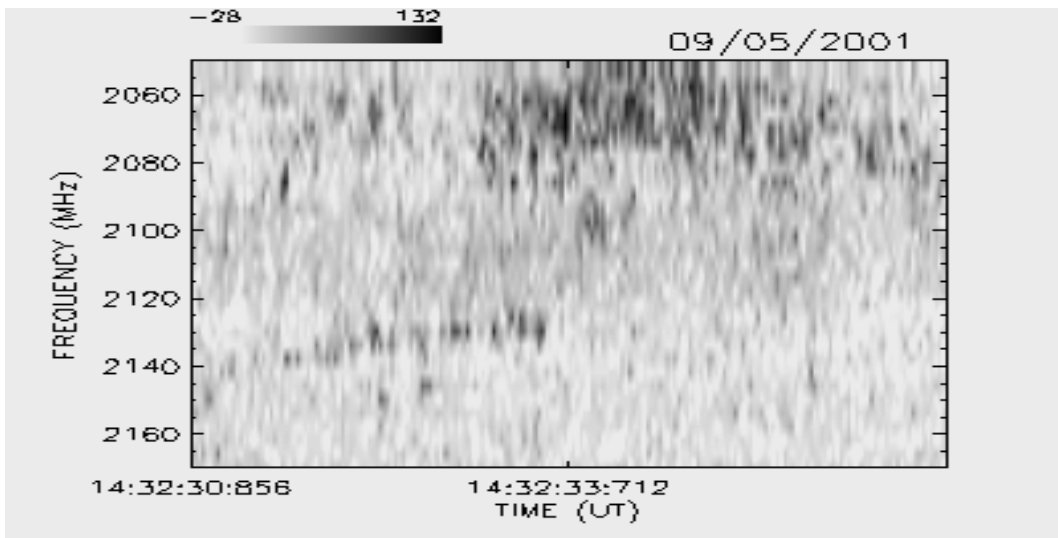
SETEMBRO / 2001



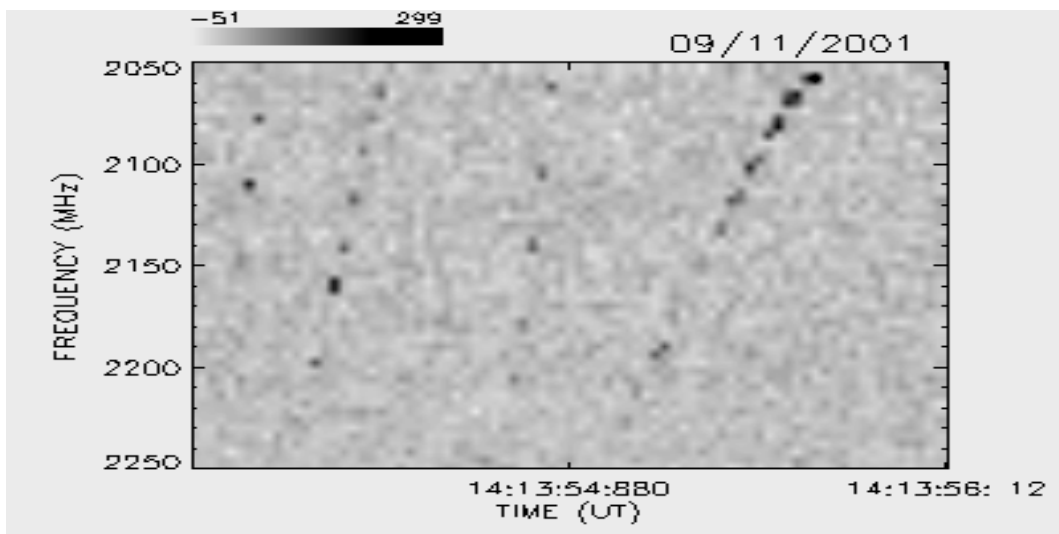
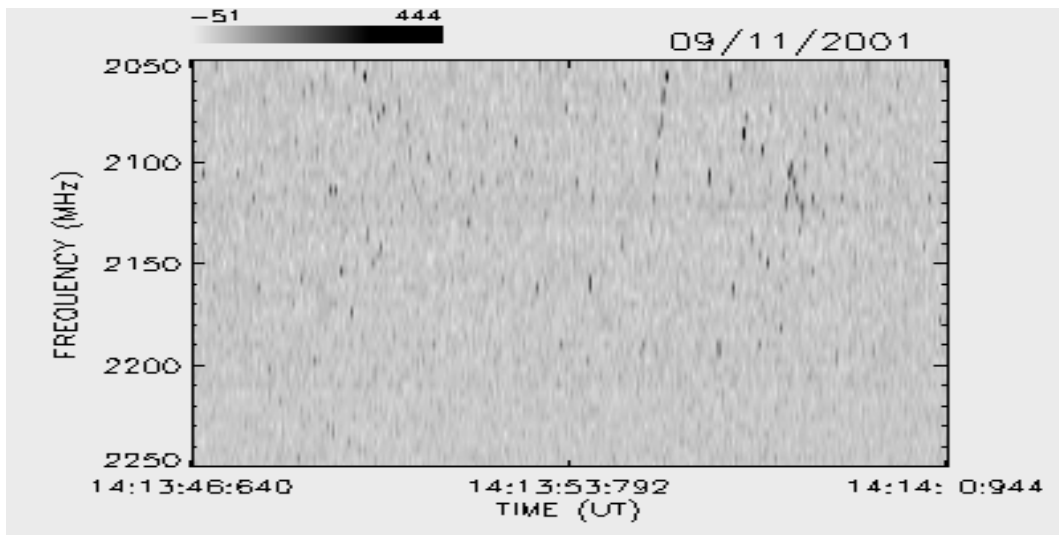
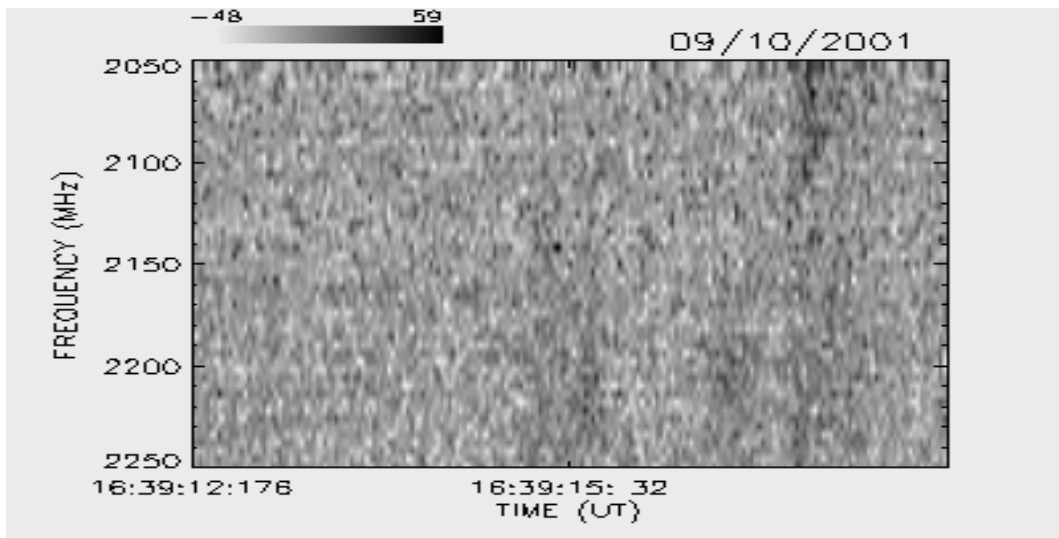
SETEMBRO / 2001



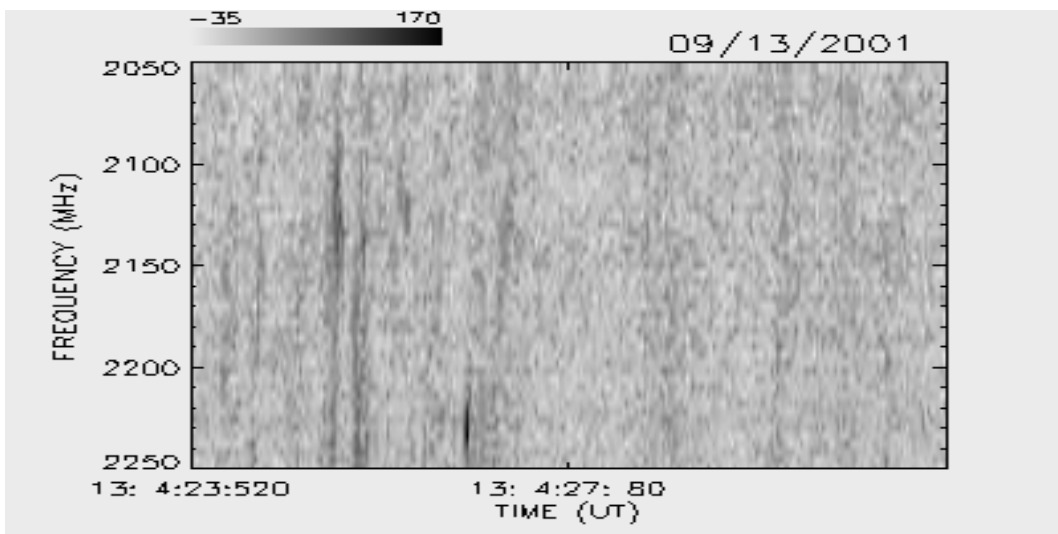
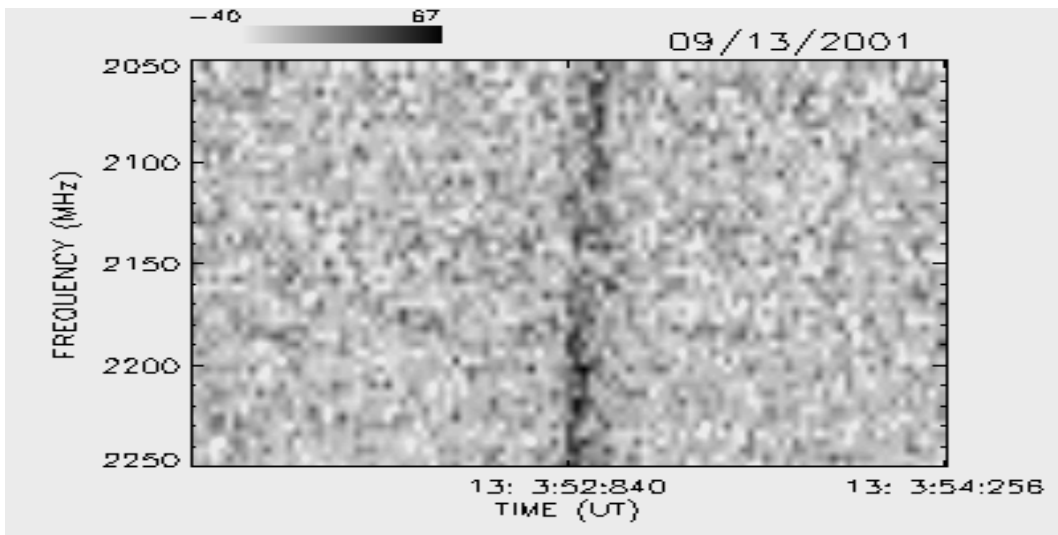
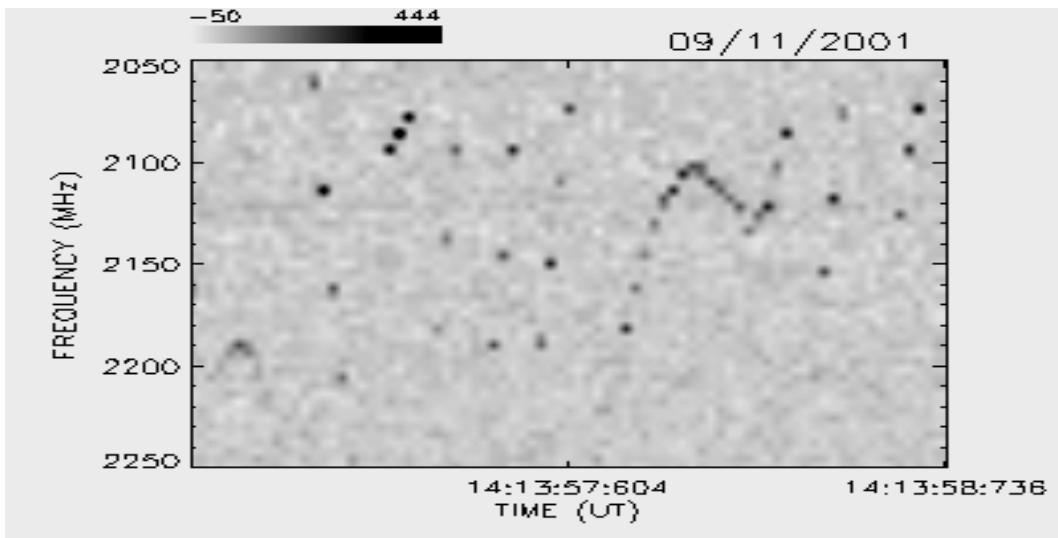
SETEMBRO / 2001



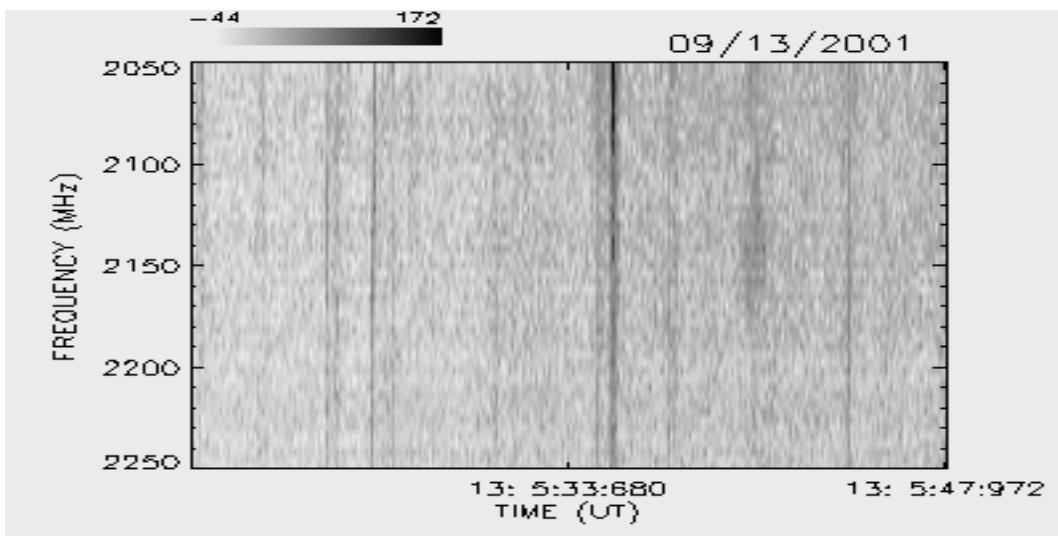
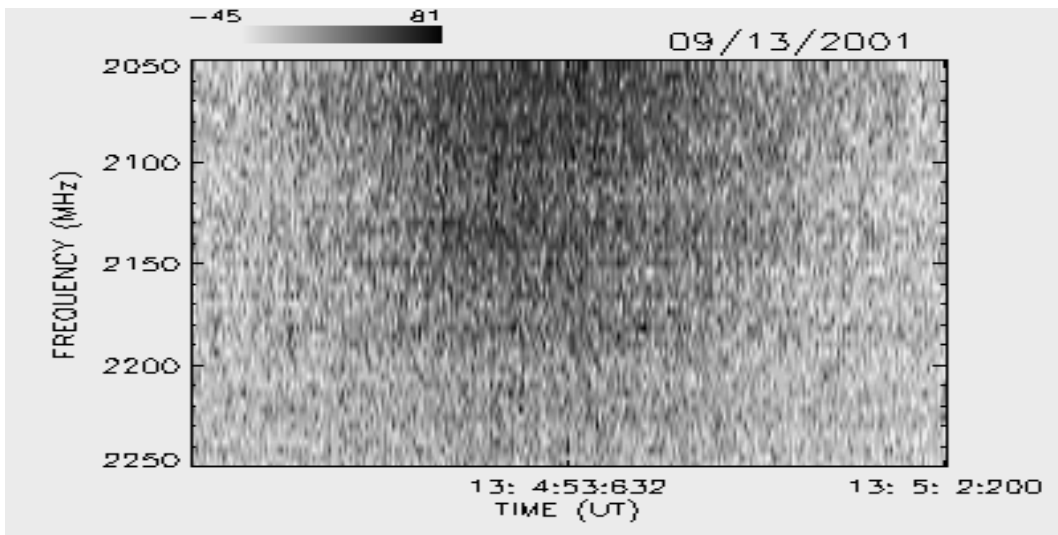
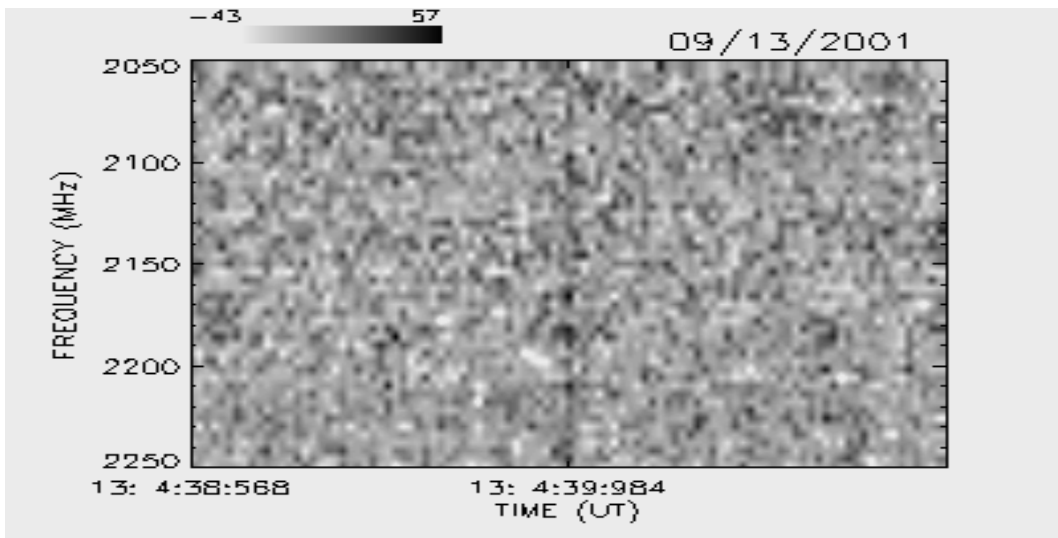
SETEMBRO / 2001



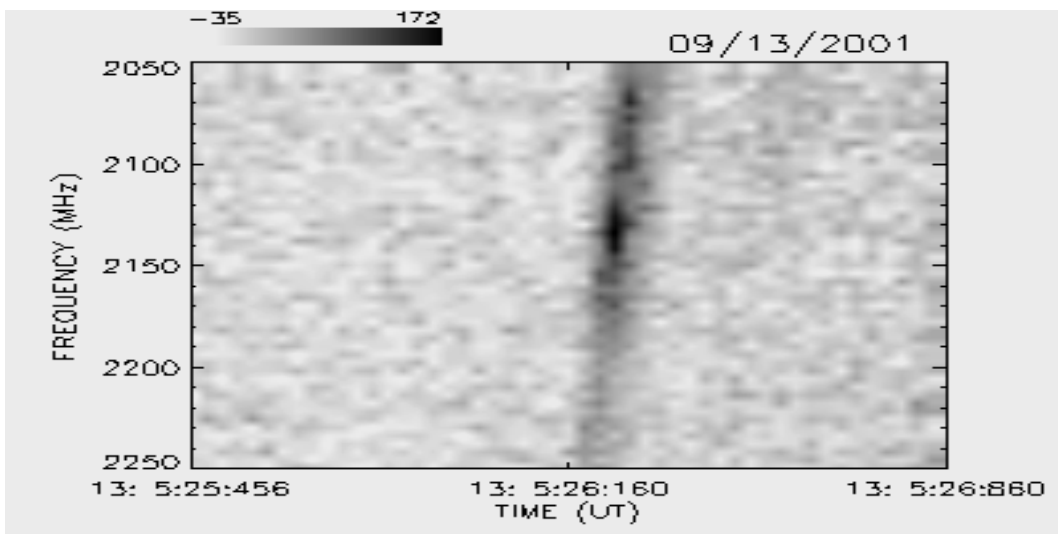
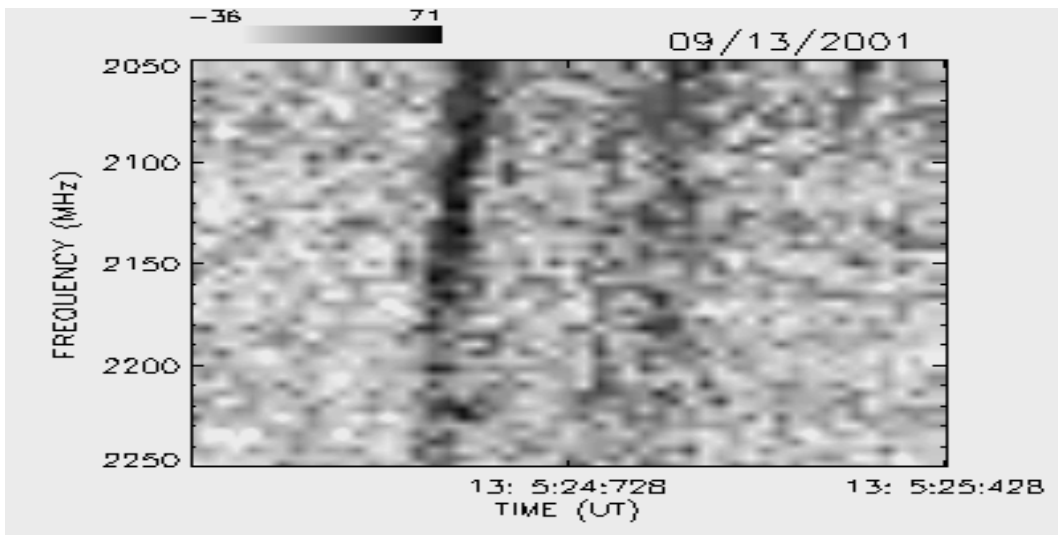
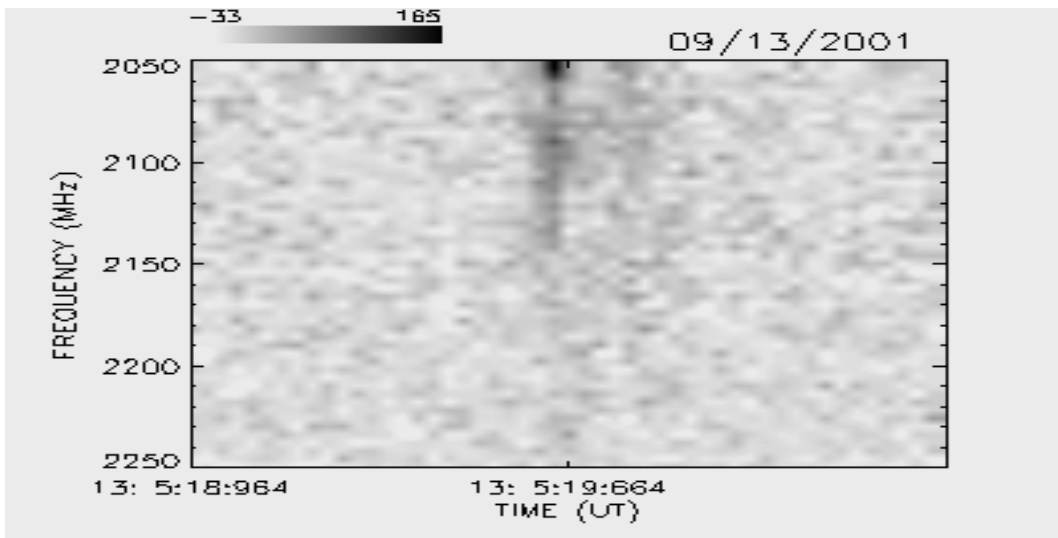
SETEMBRO / 2001



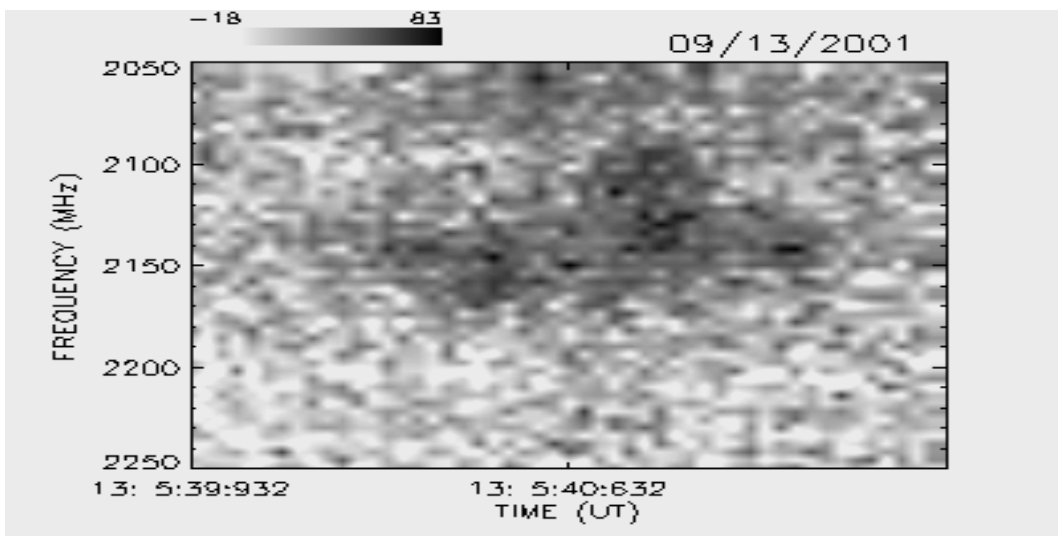
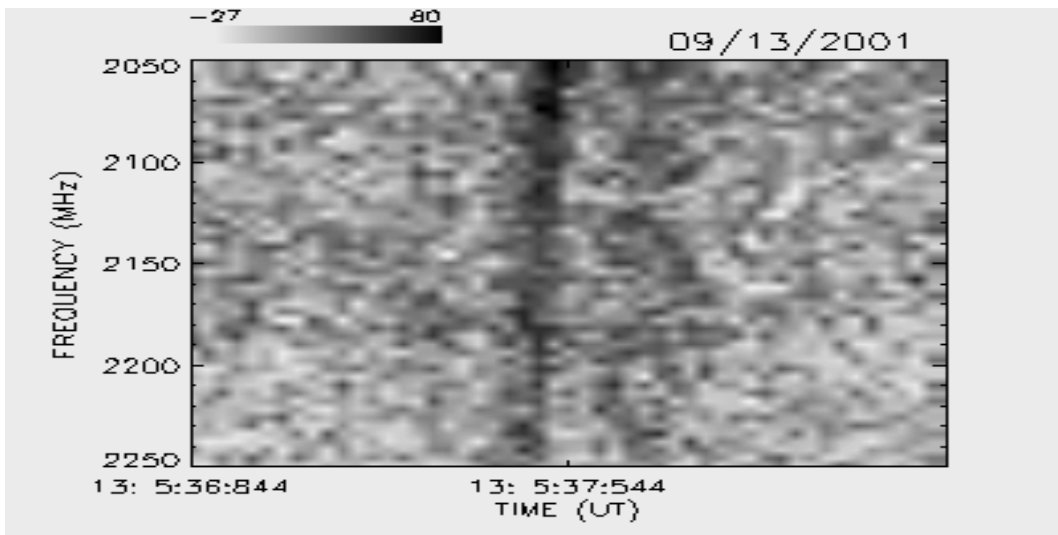
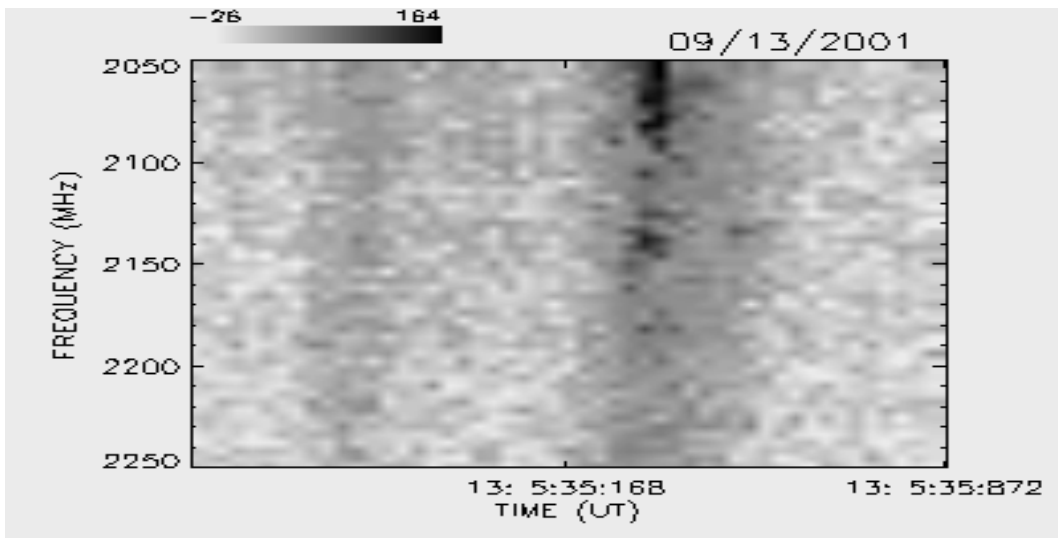
SETEMBRO / 2001



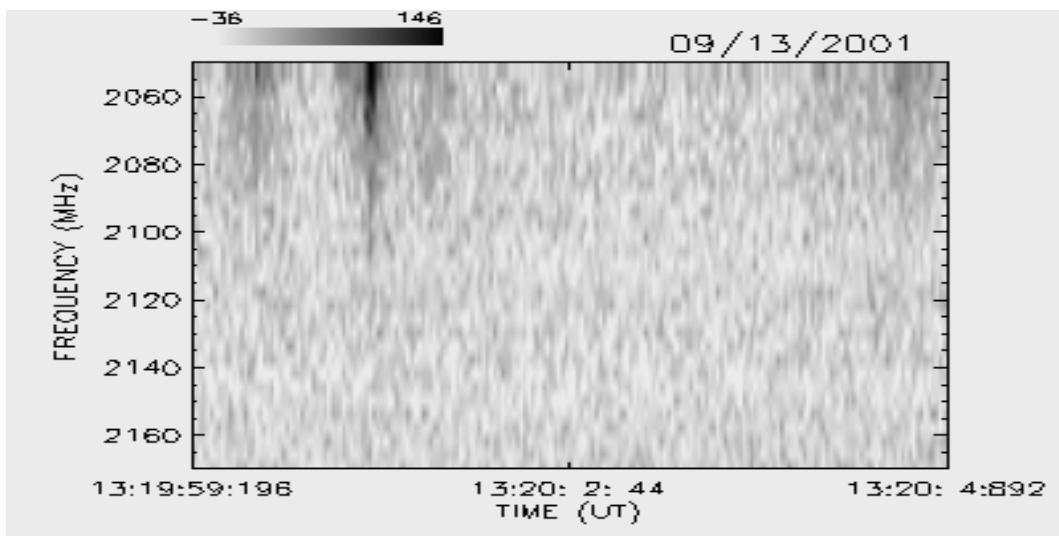
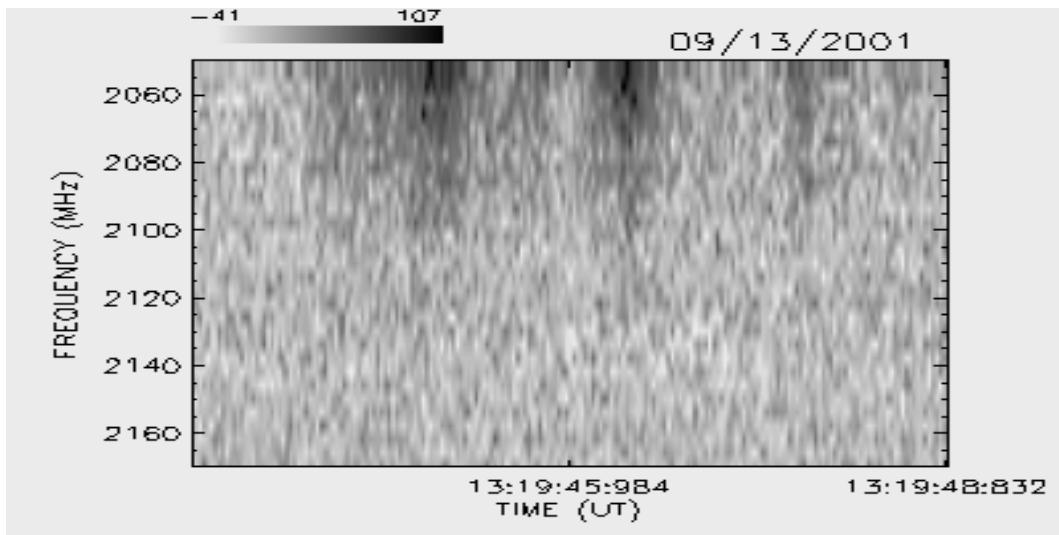
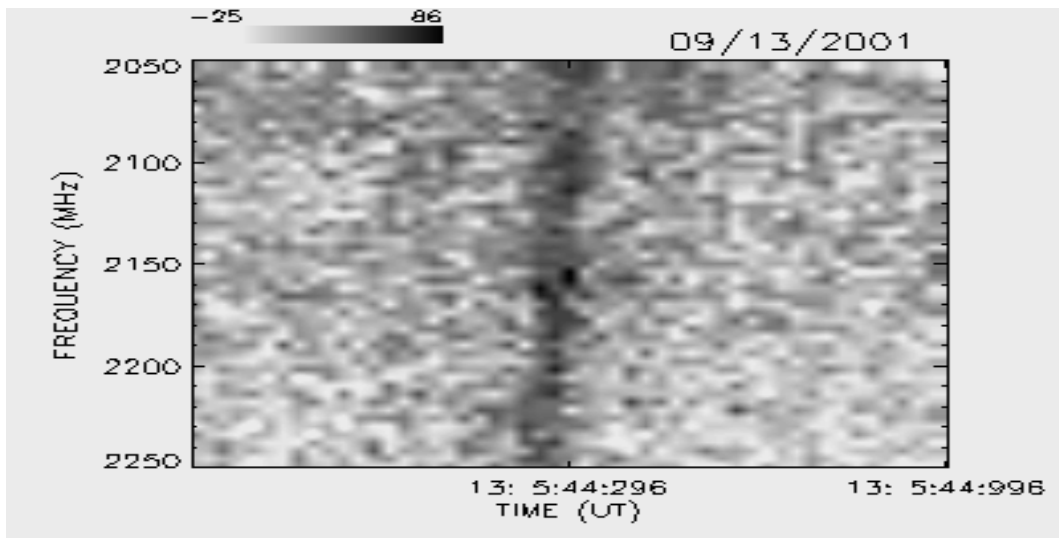
SETEMBRO / 2001



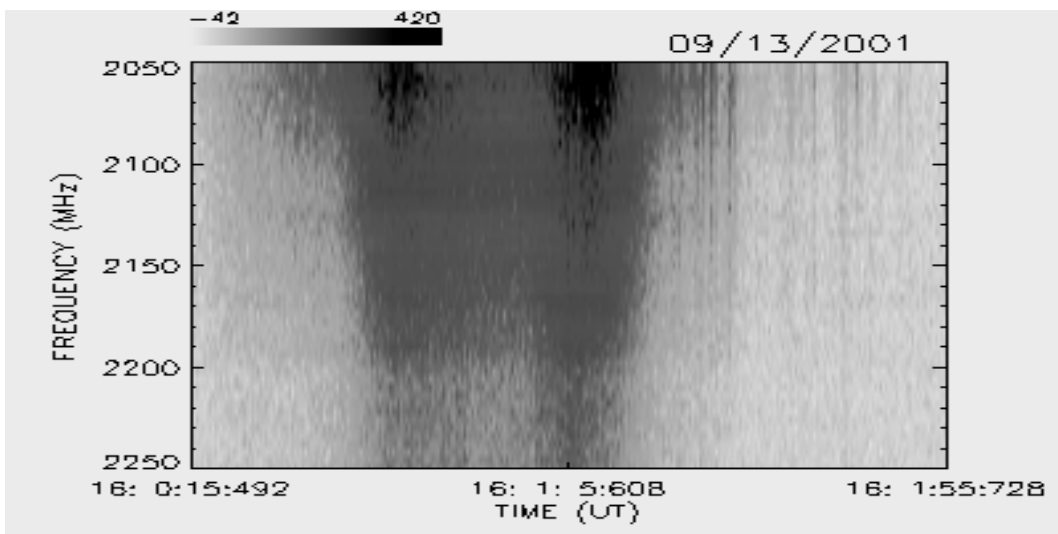
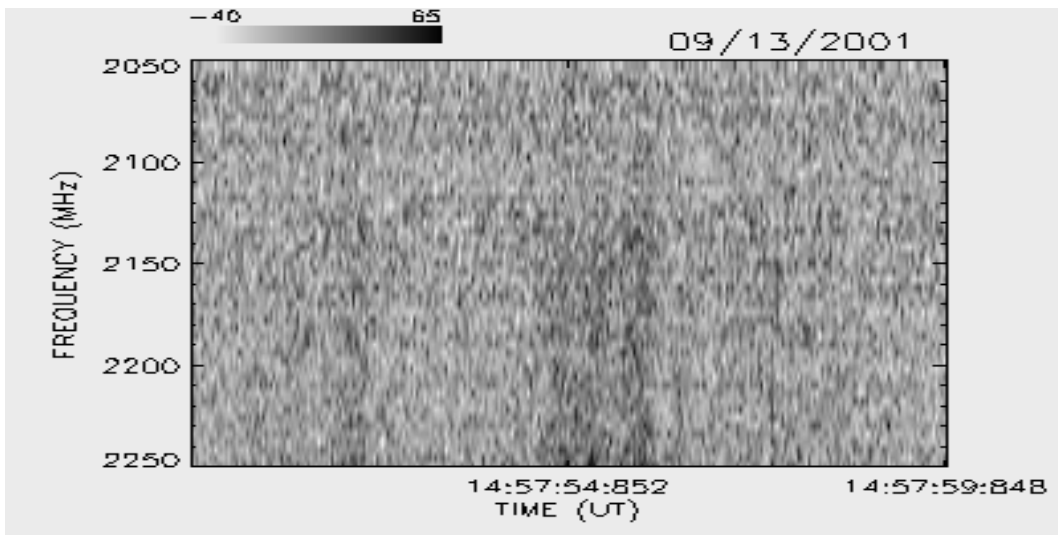
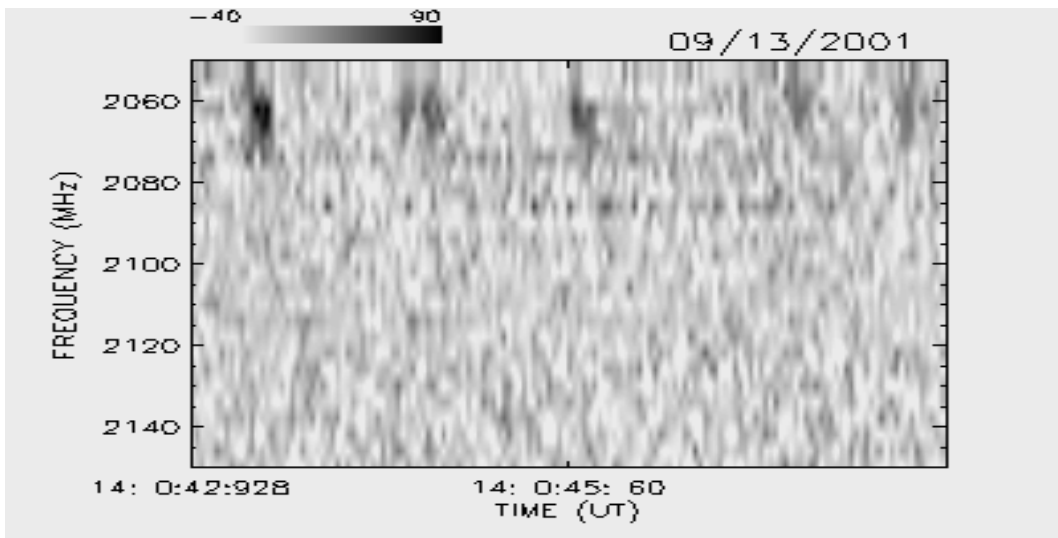
SETEMBRO / 2001



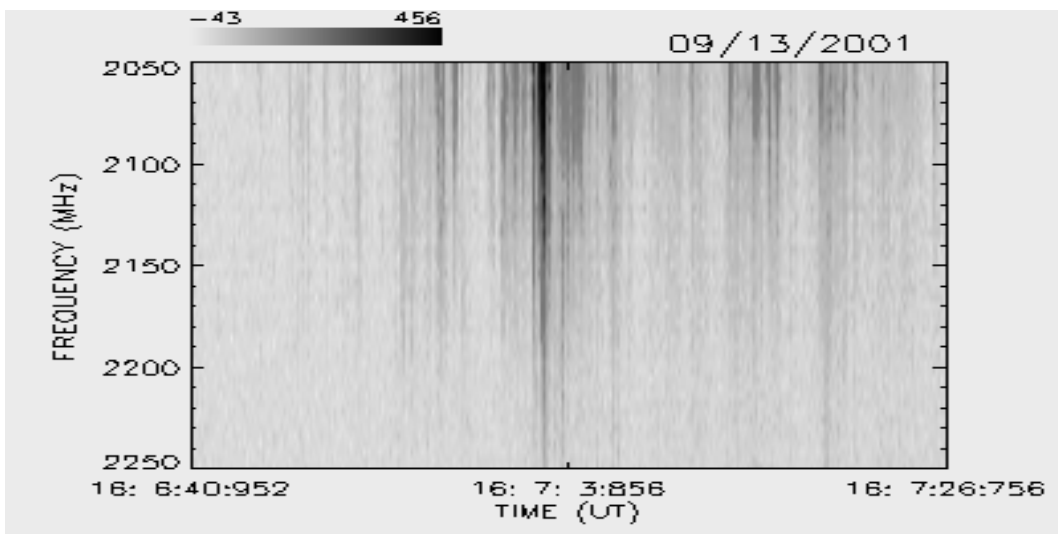
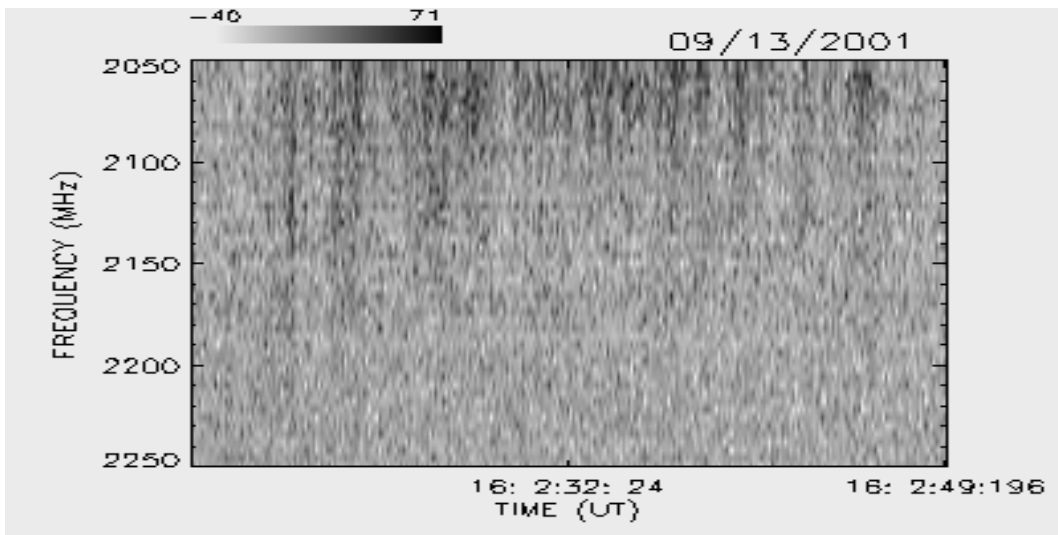
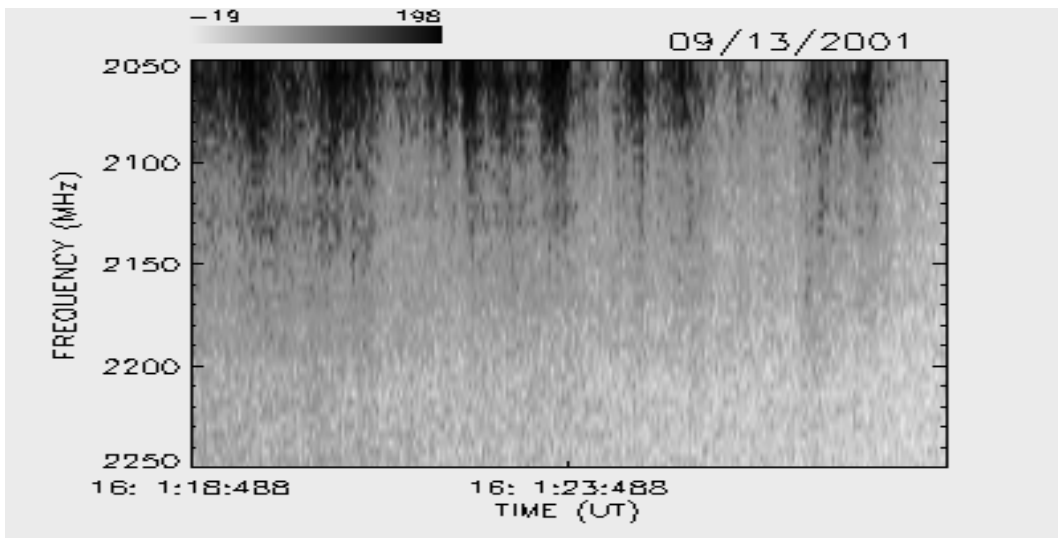
SETEMBRO / 2001



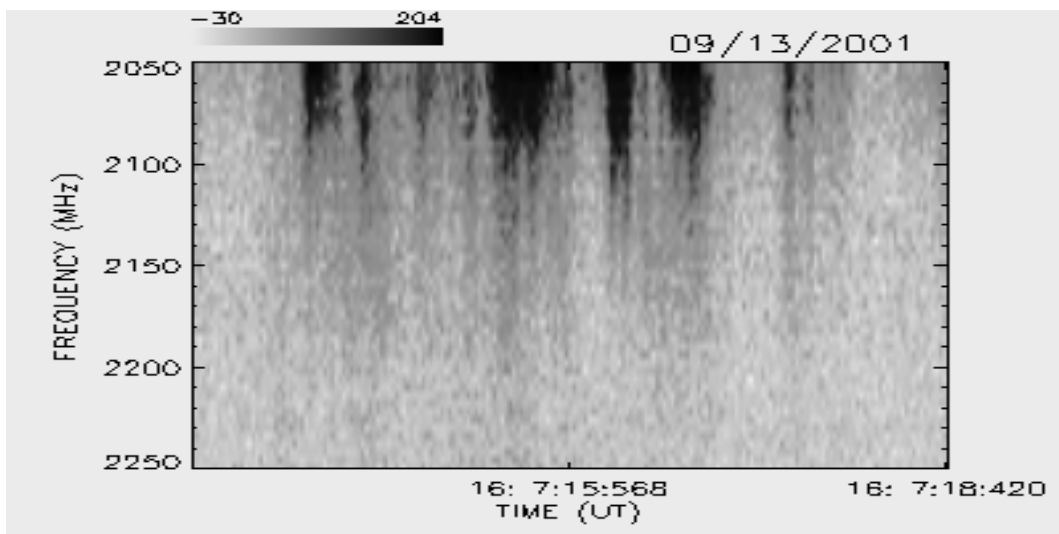
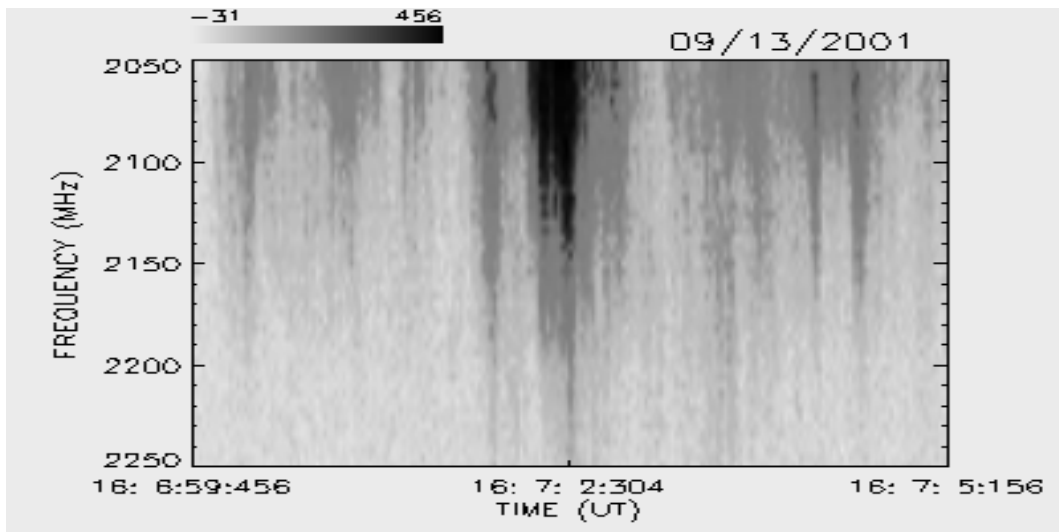
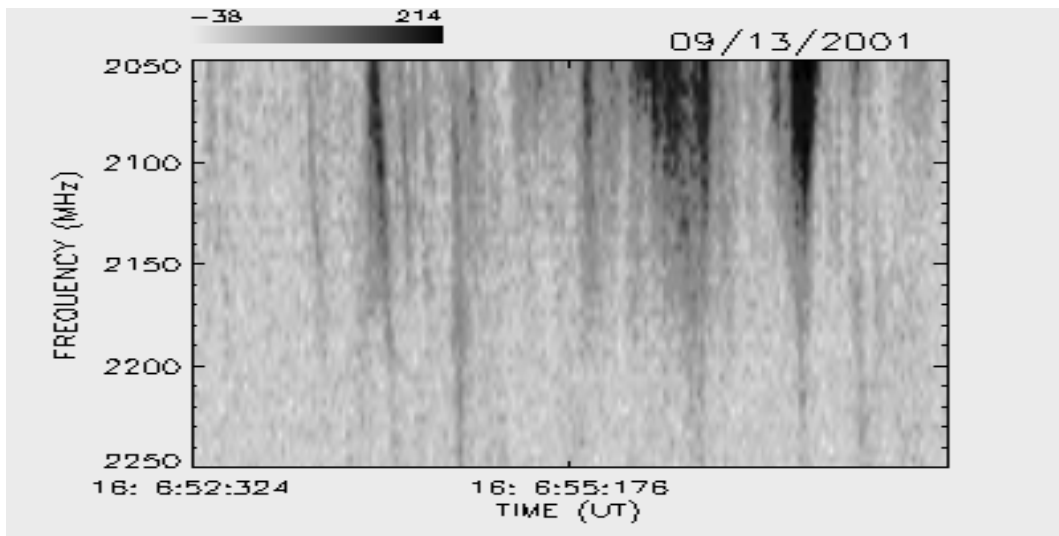
SETEMBRO / 2001



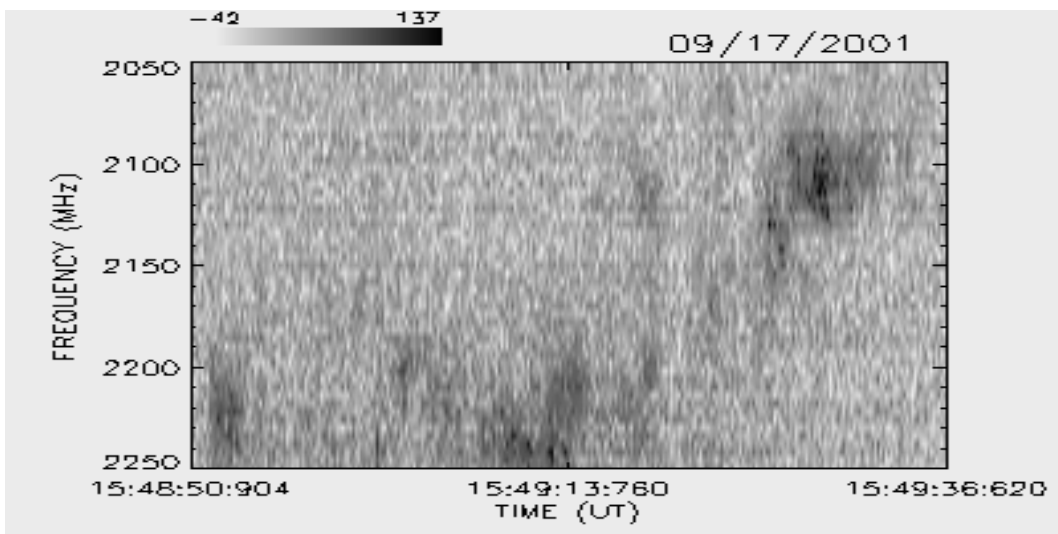
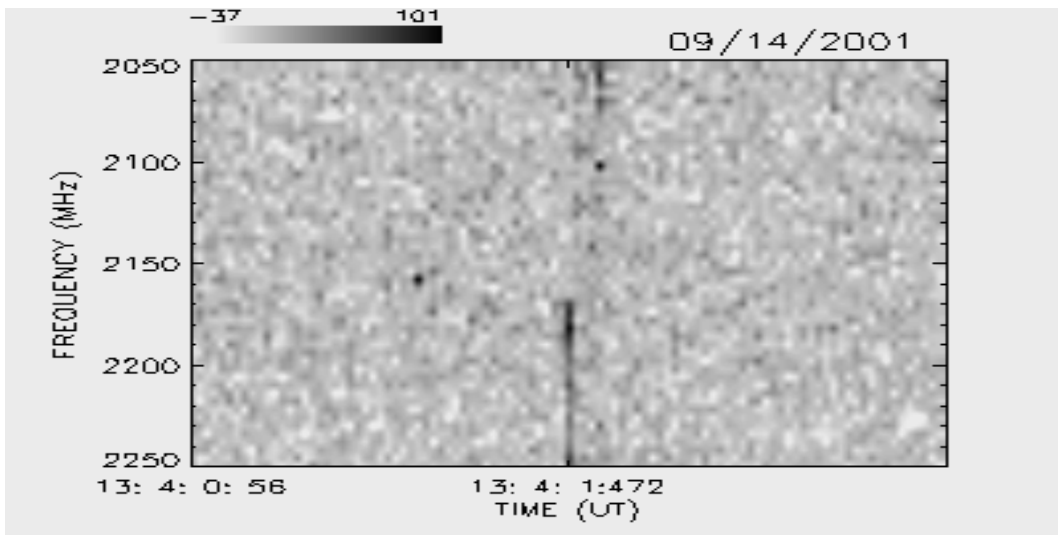
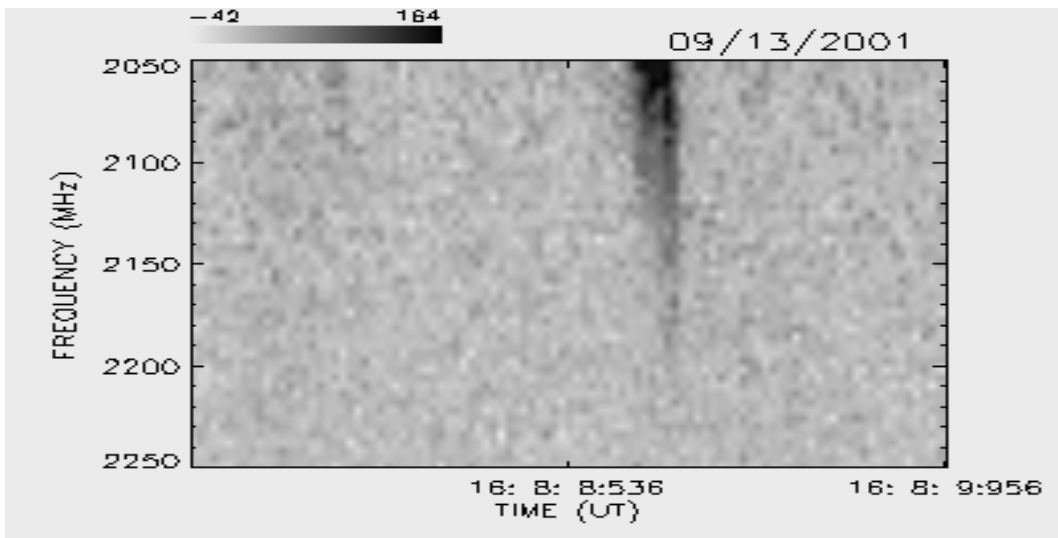
SETEMBRO / 2001



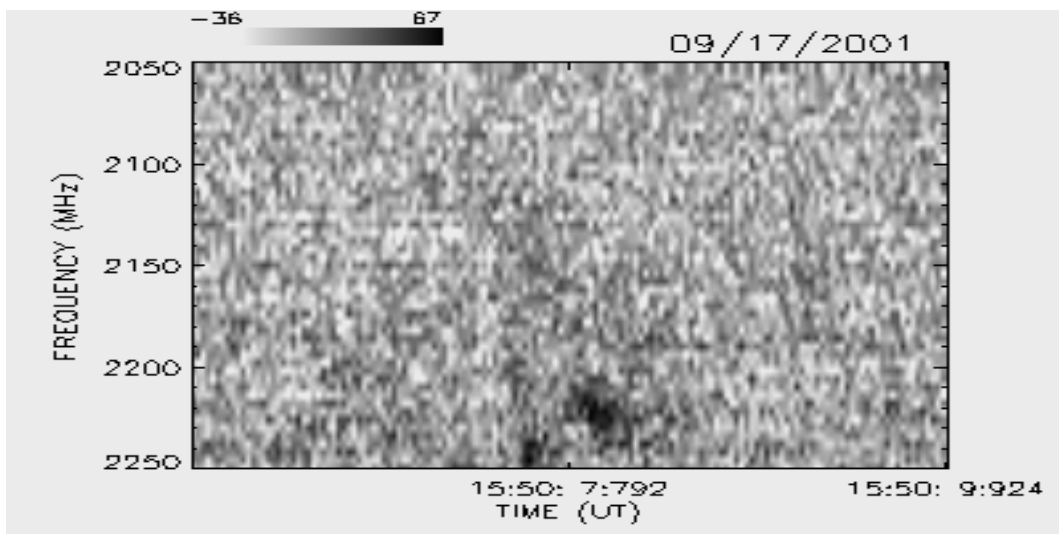
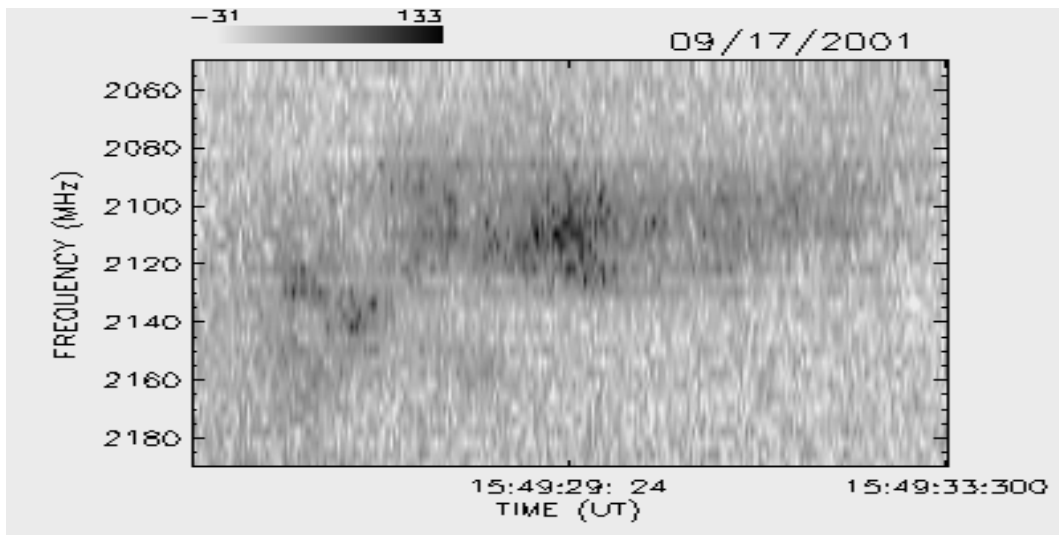
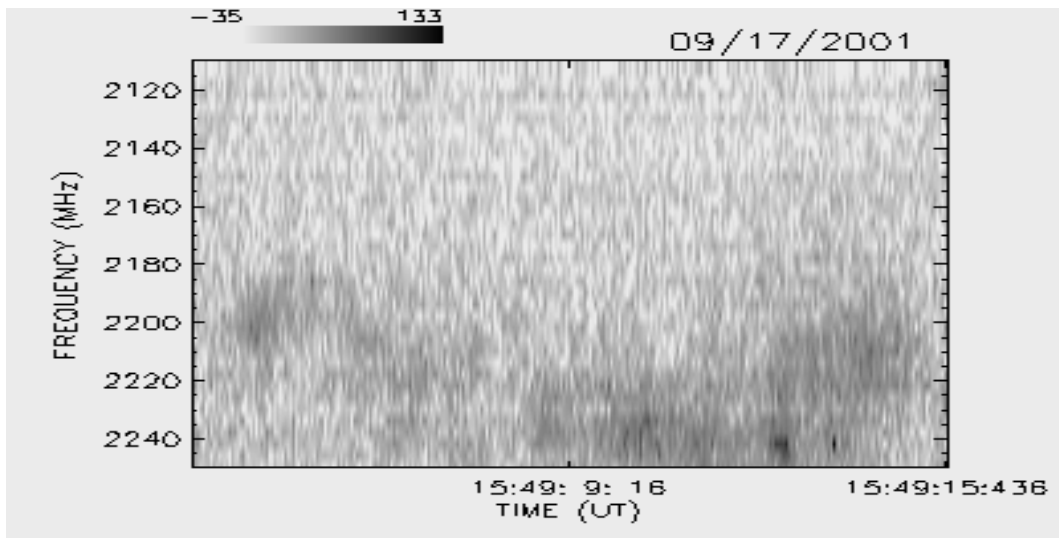
SETEMBRO / 2001



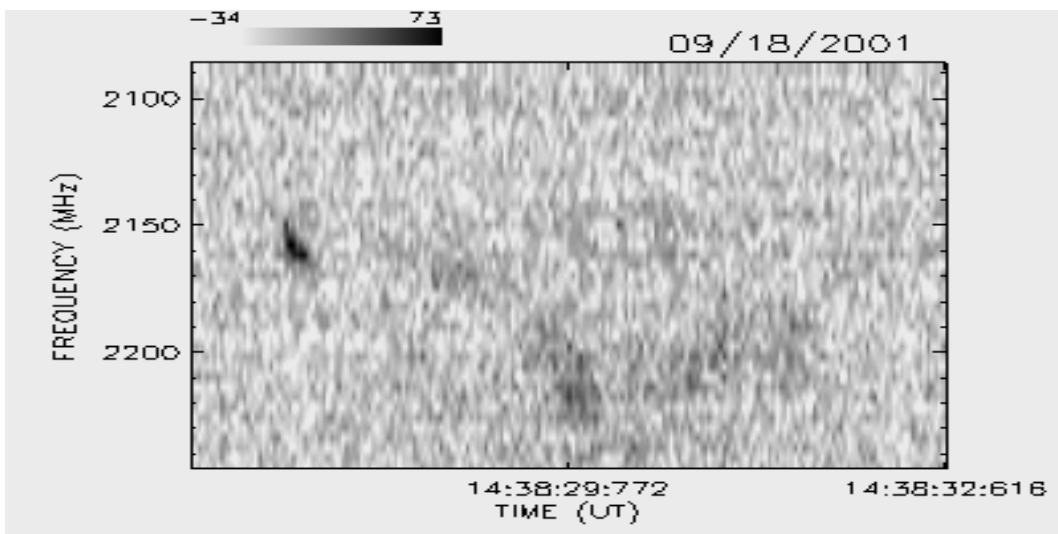
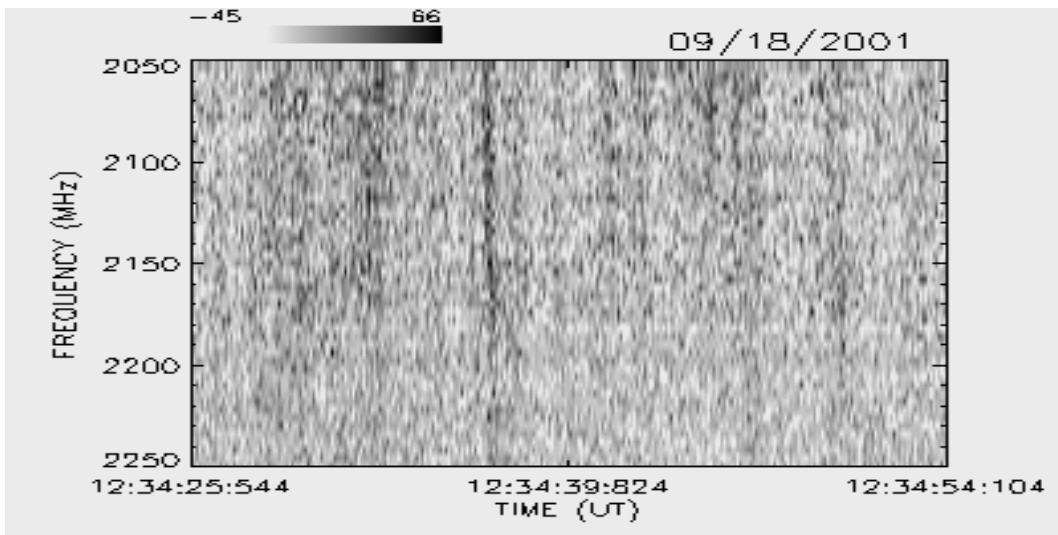
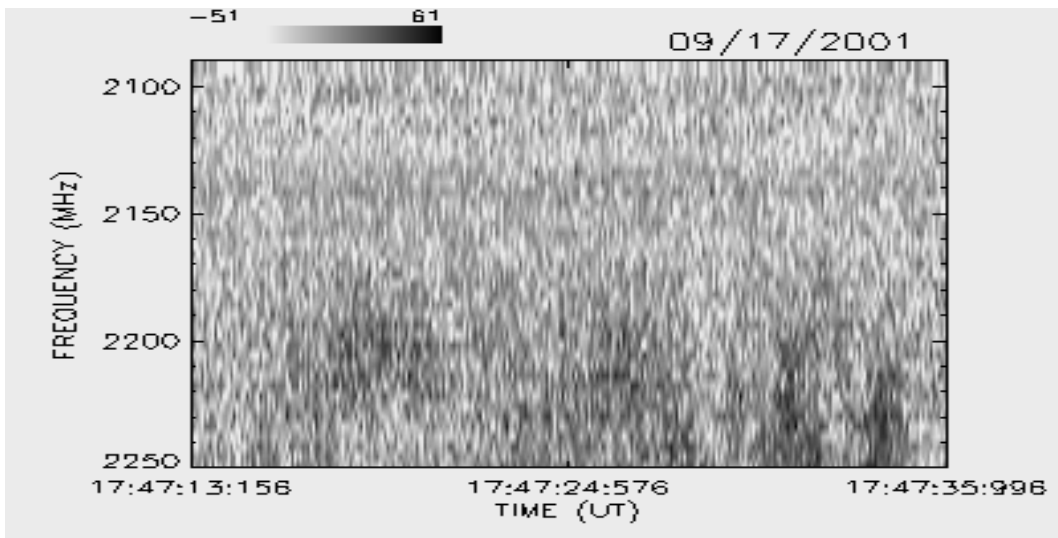
SETEMBRO / 2001



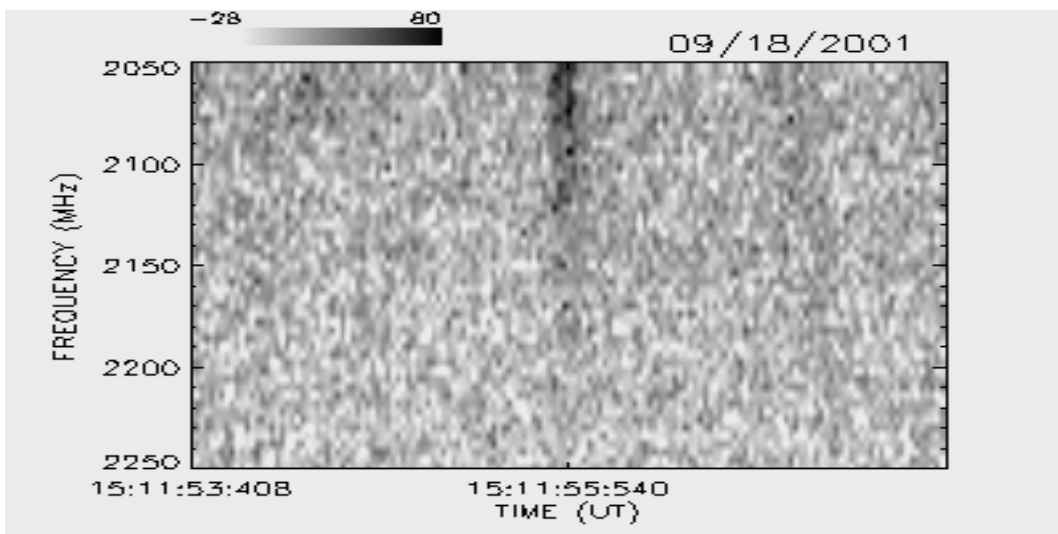
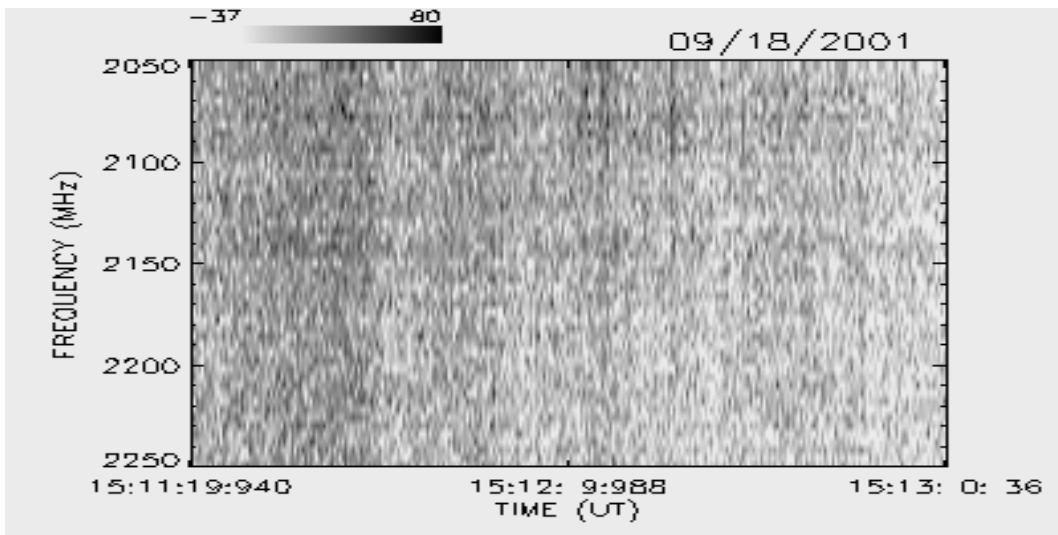
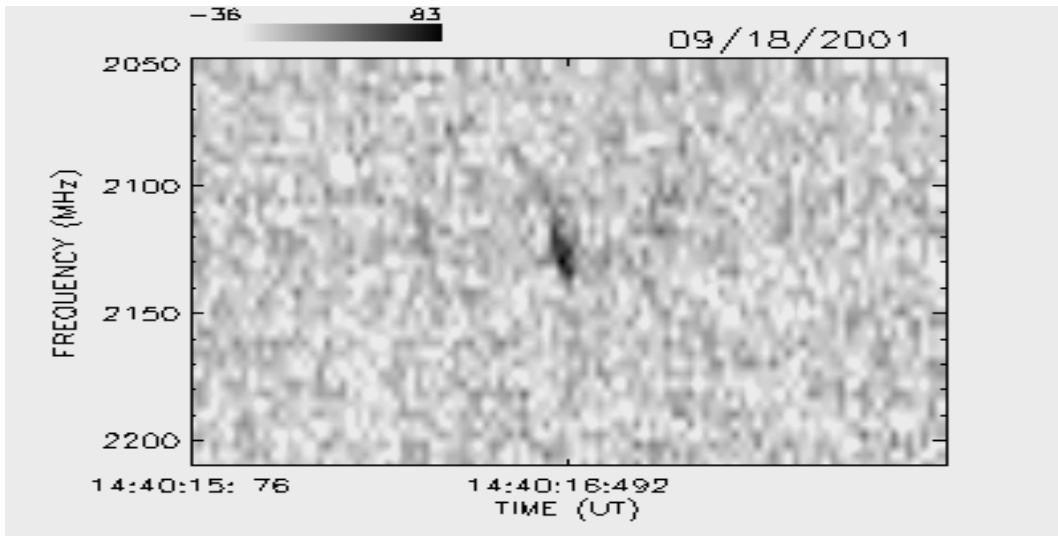
SETEMBRO / 2001



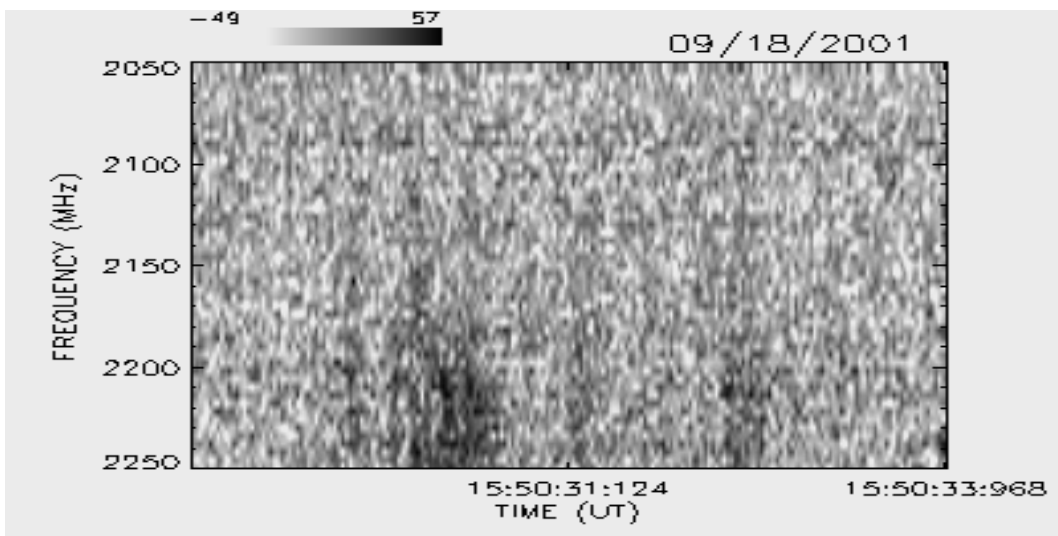
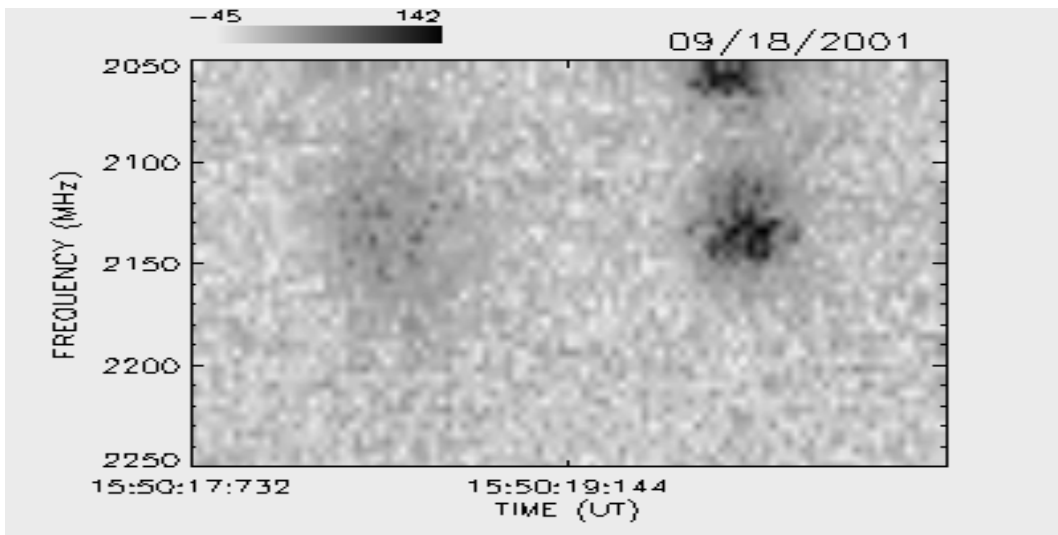
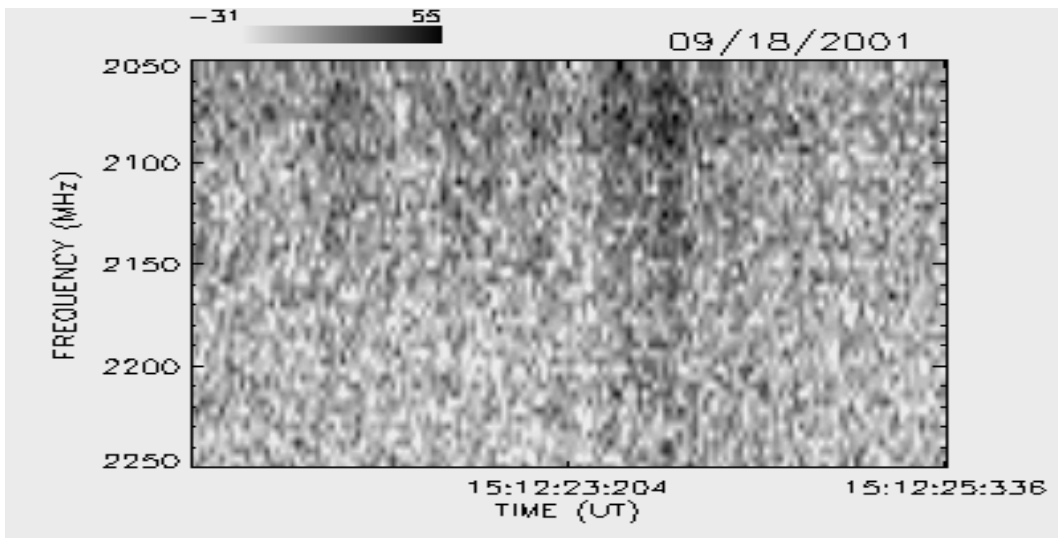
SETEMBRO / 2001



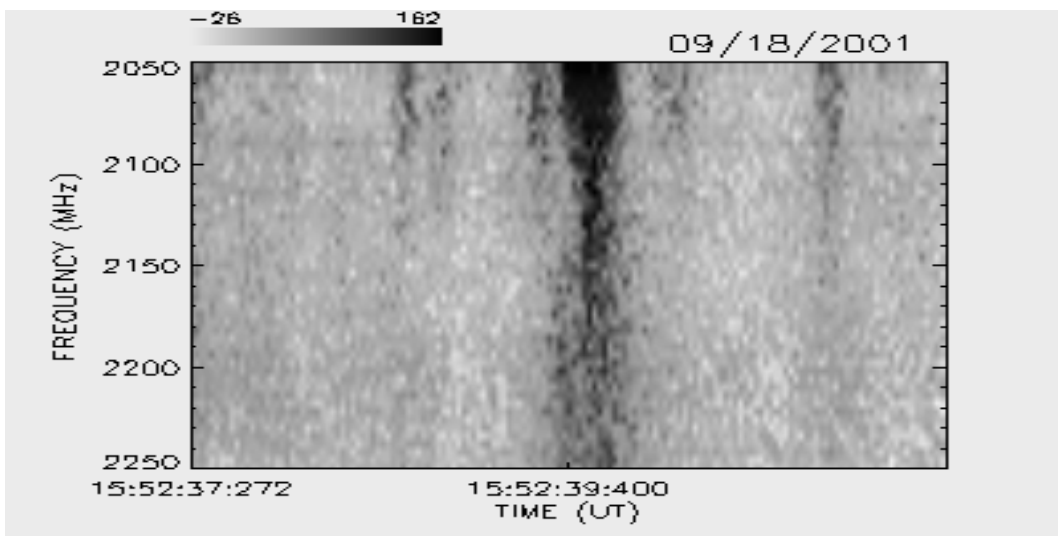
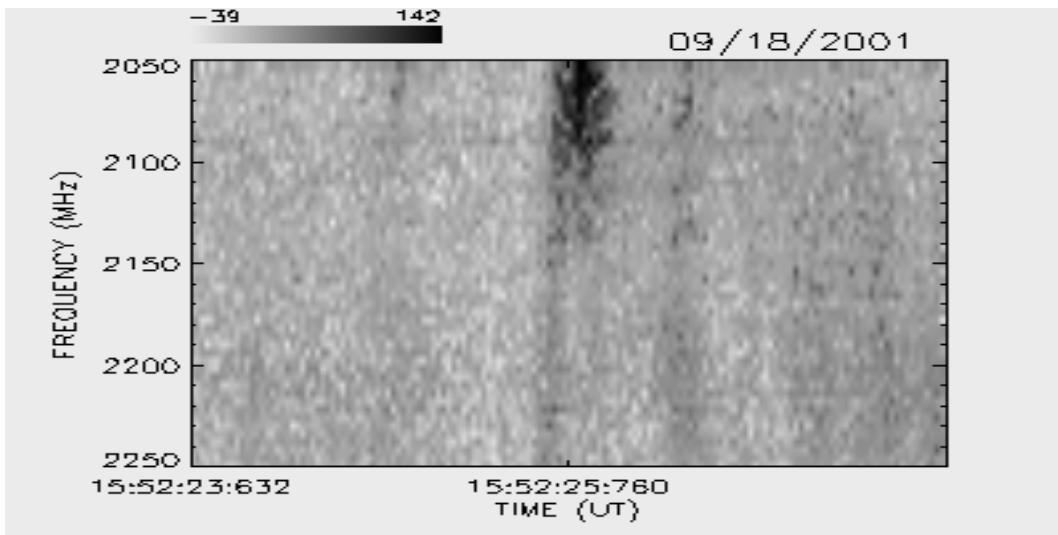
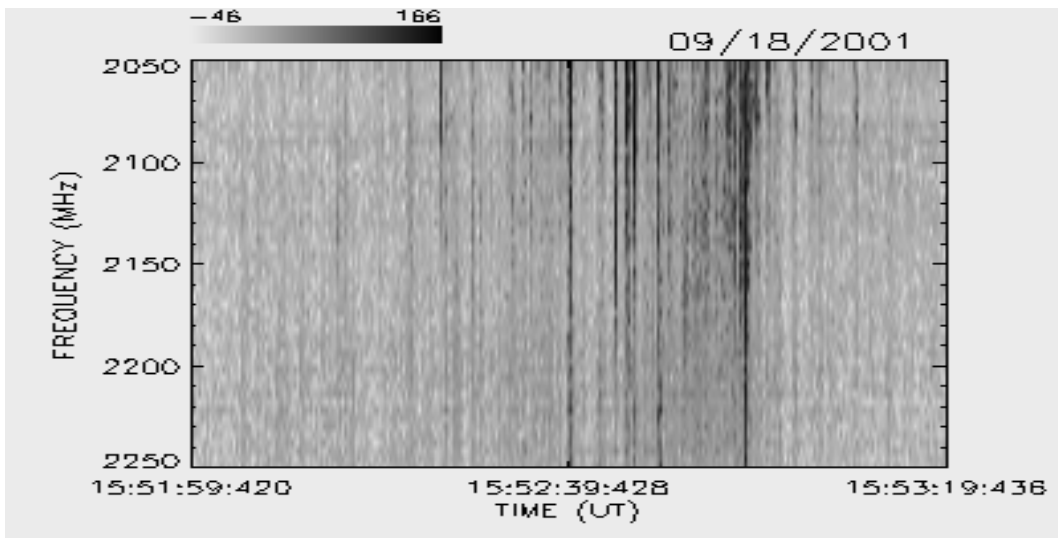
SETEMBRO / 2001



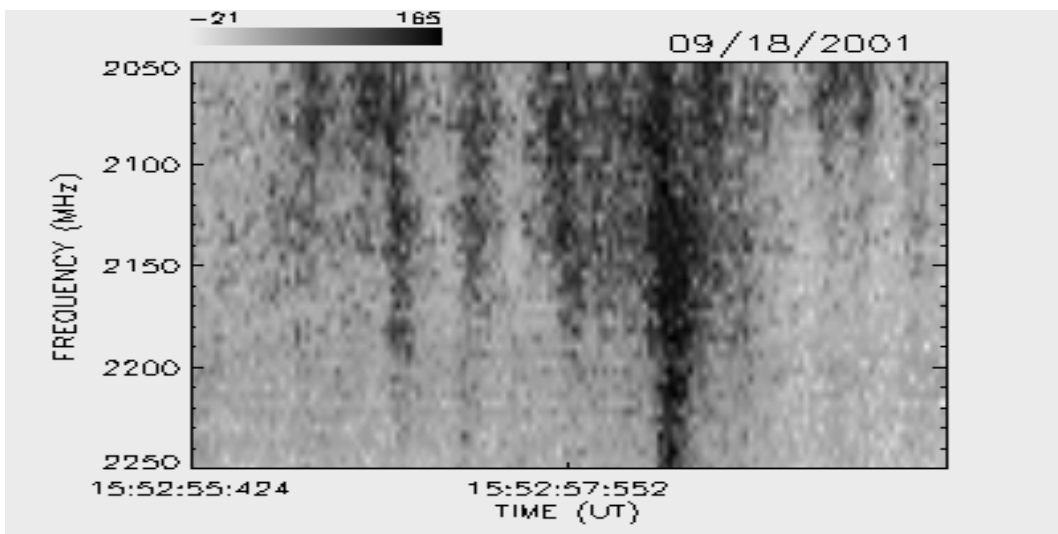
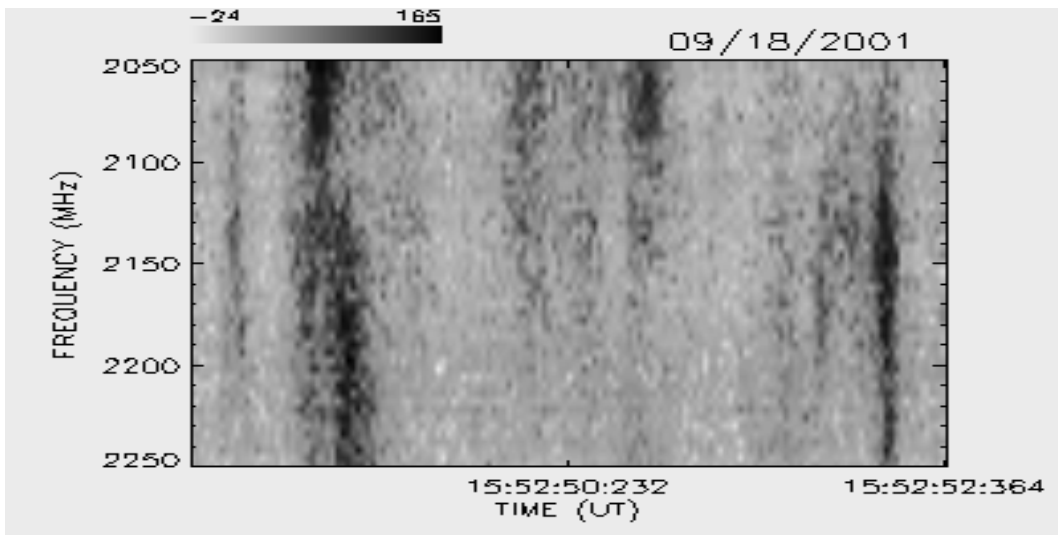
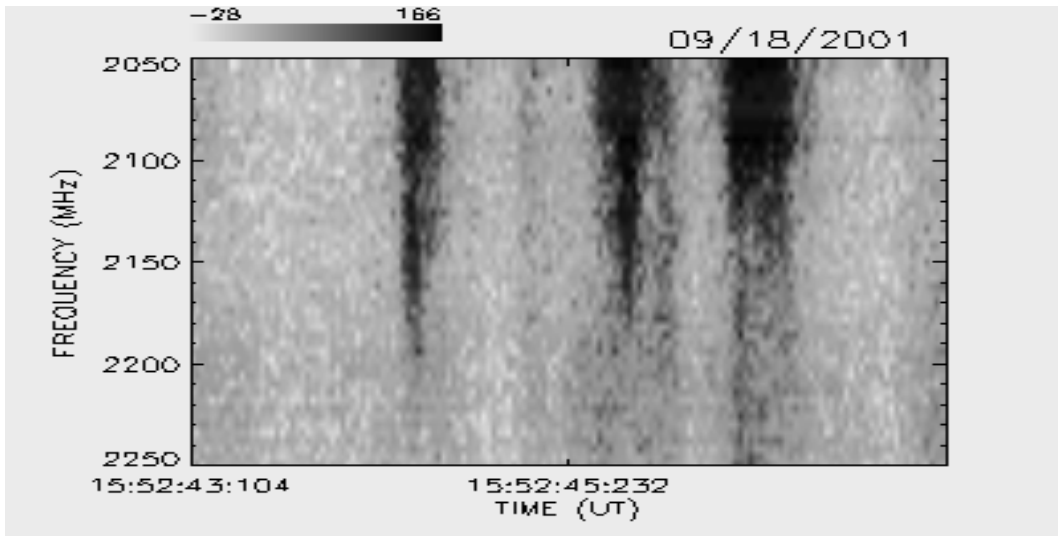
SETEMBRO / 2001



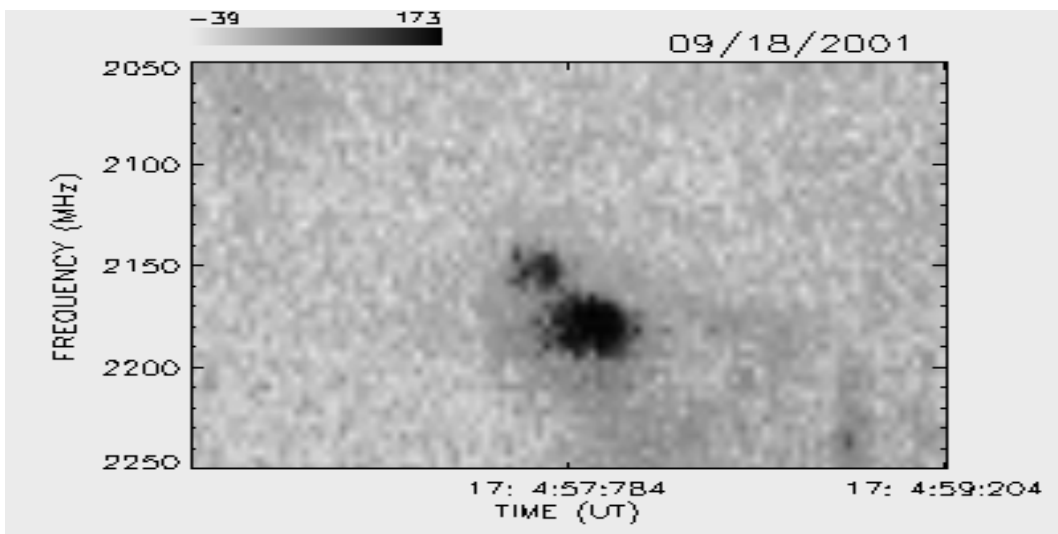
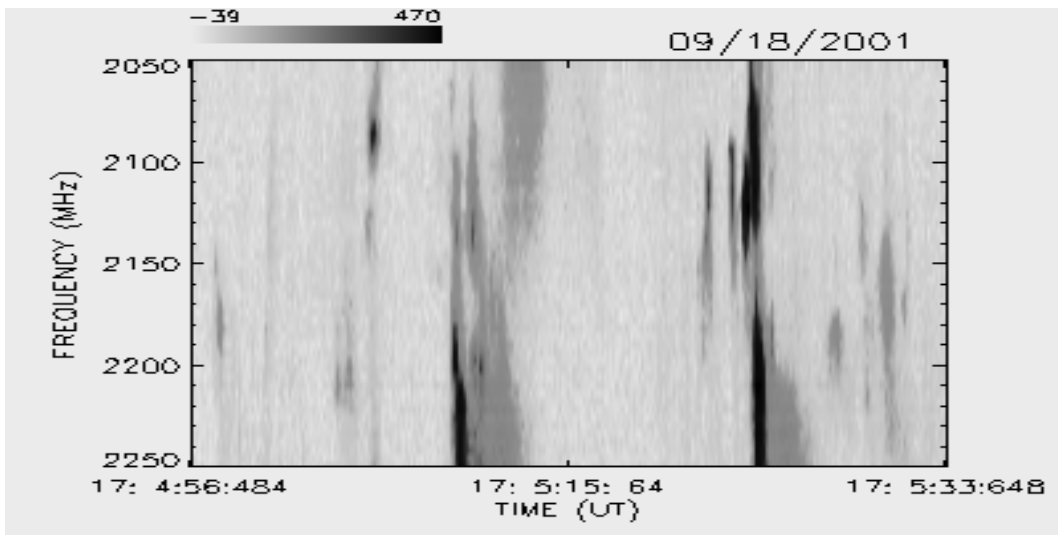
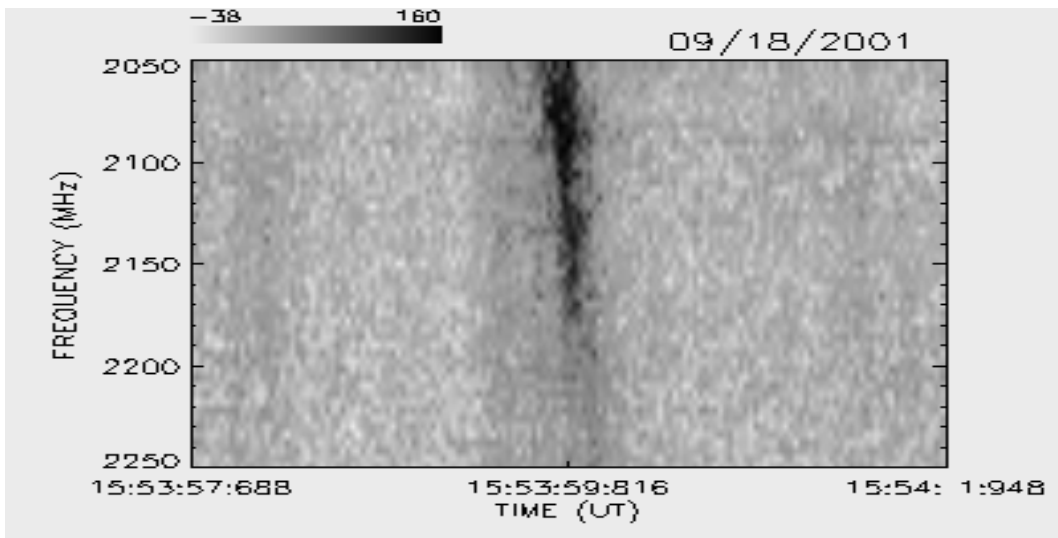
SETEMBRO / 2001



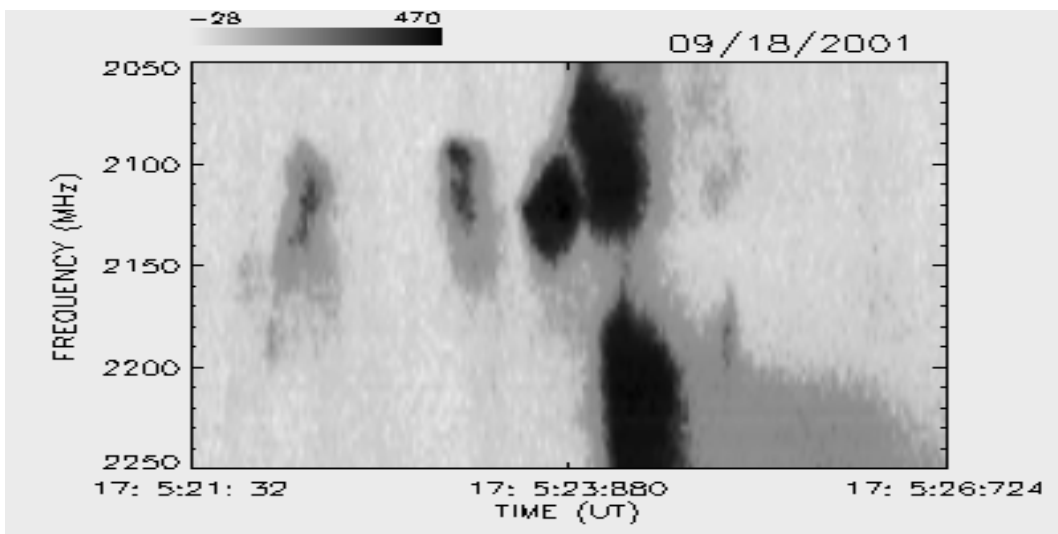
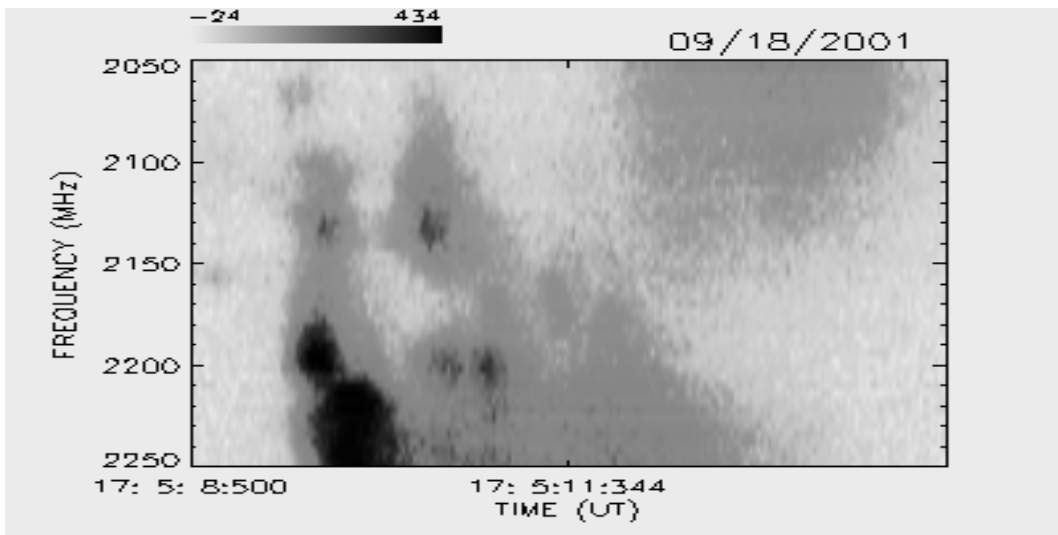
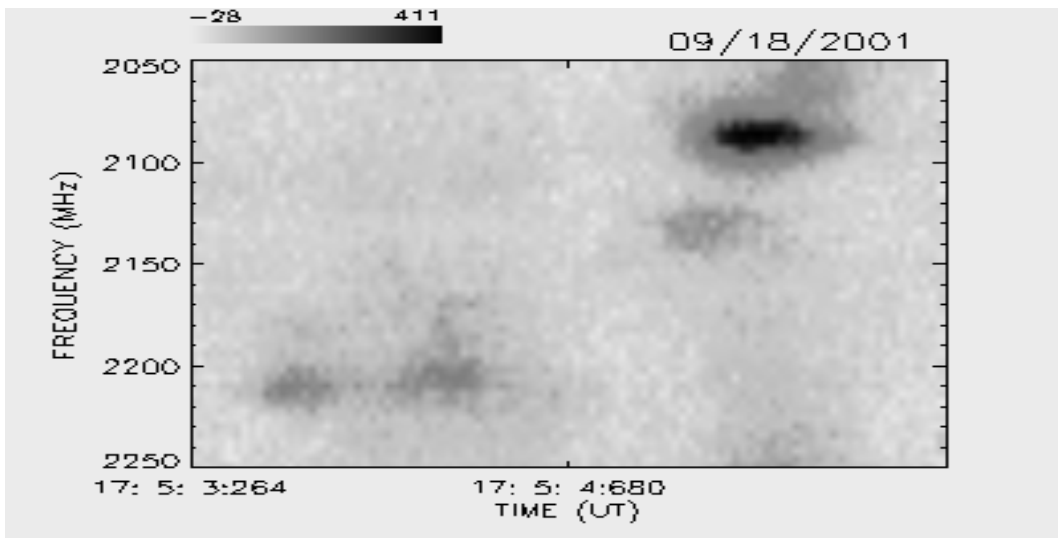
SETEMBRO / 2001



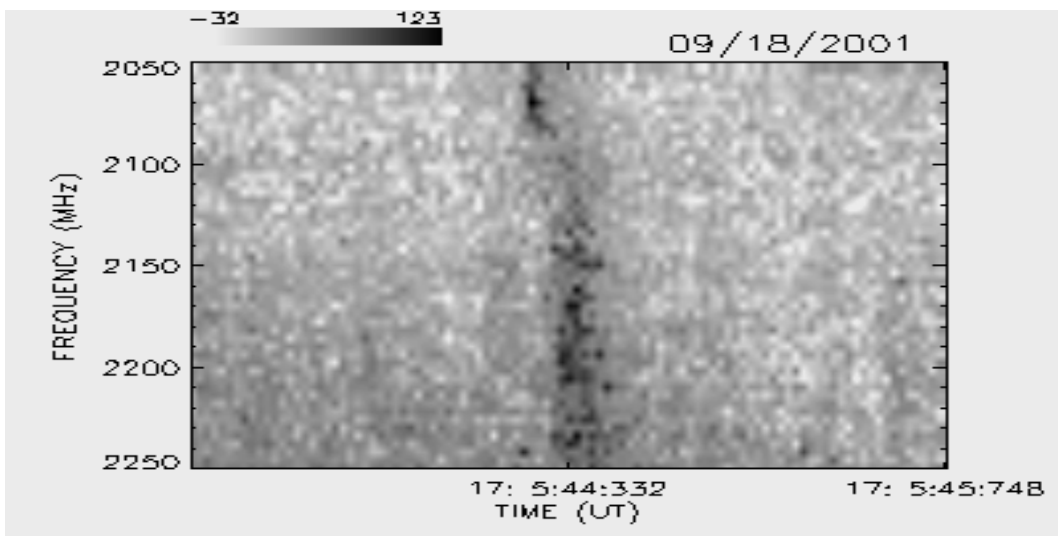
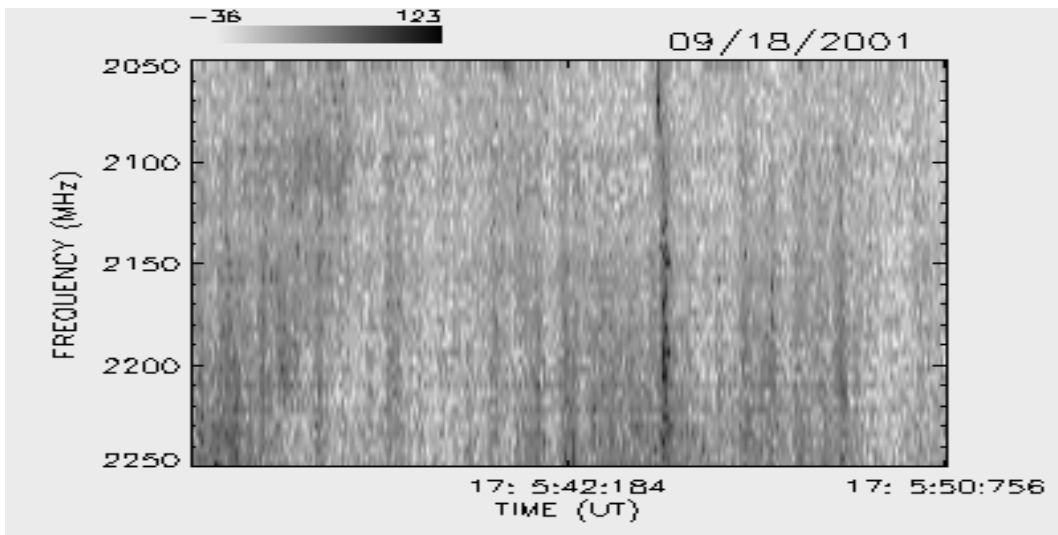
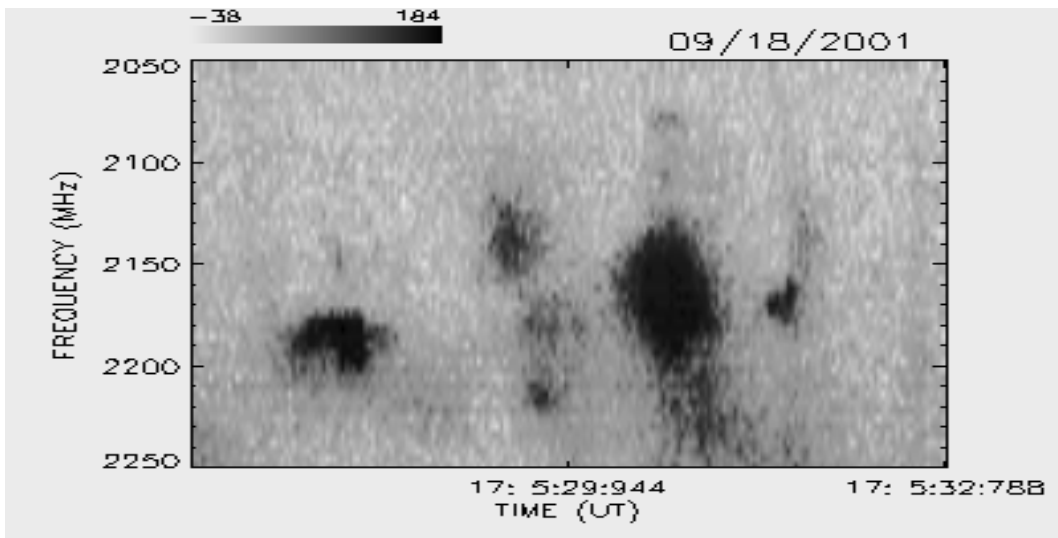
SETEMBRO / 2001



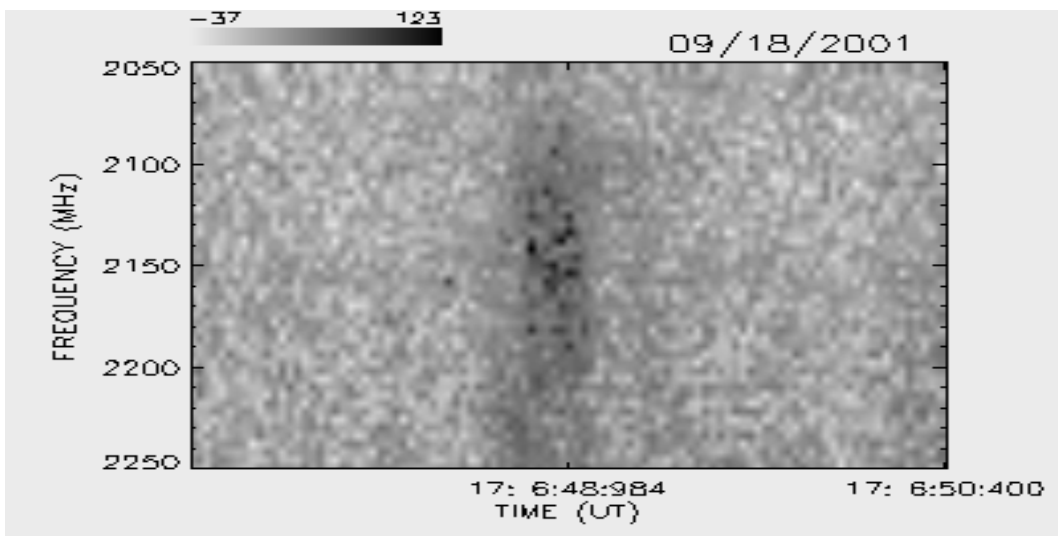
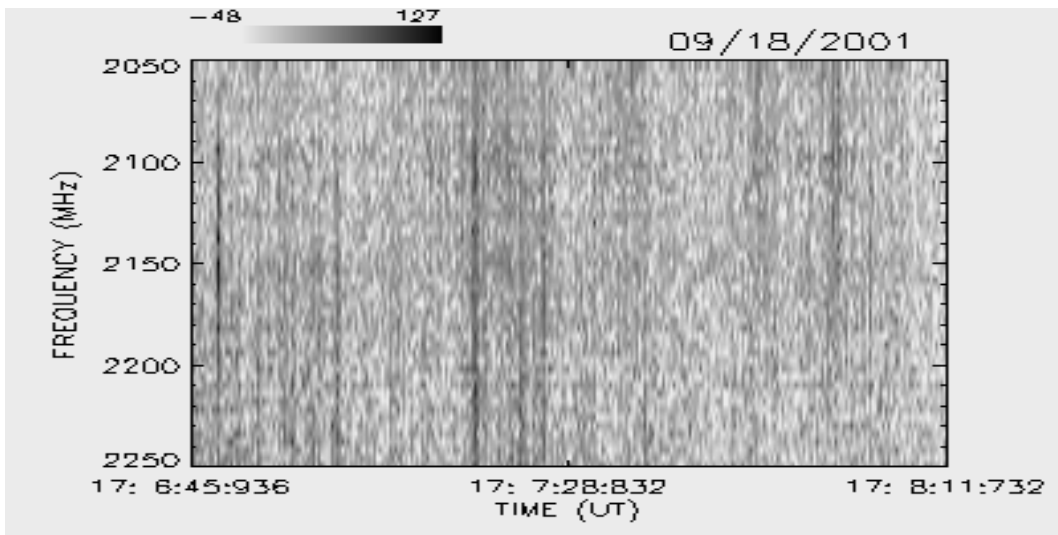
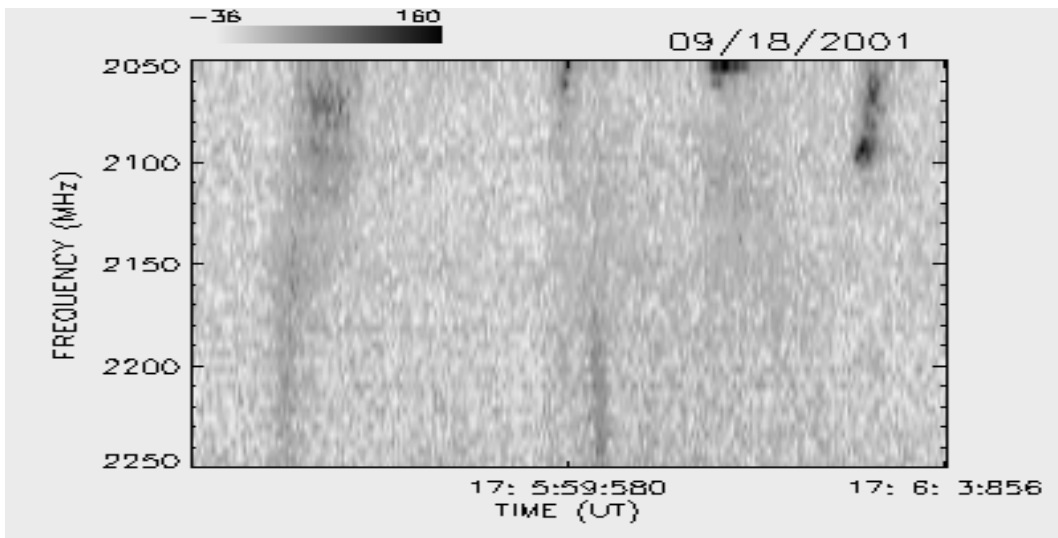
SETEMBRO / 2001



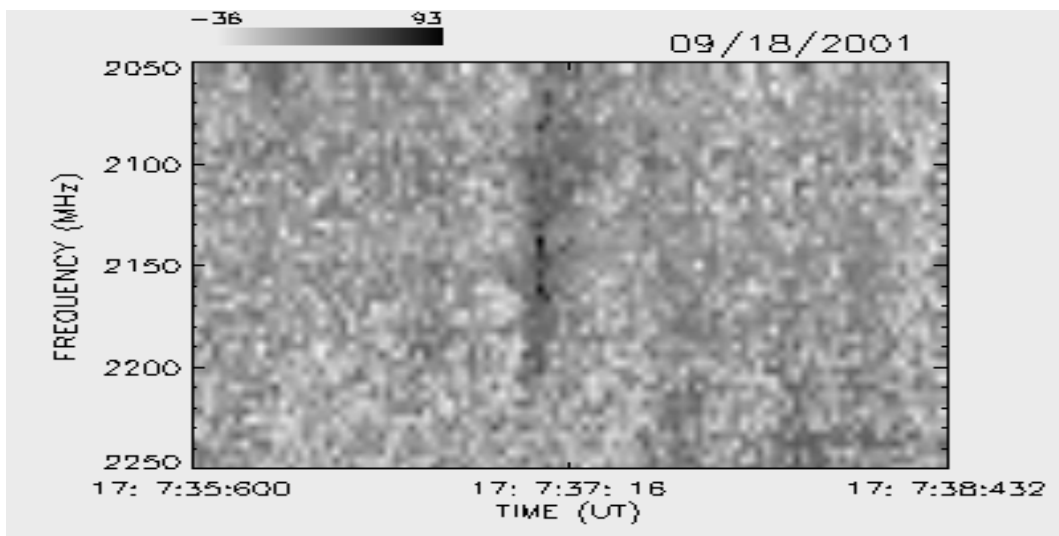
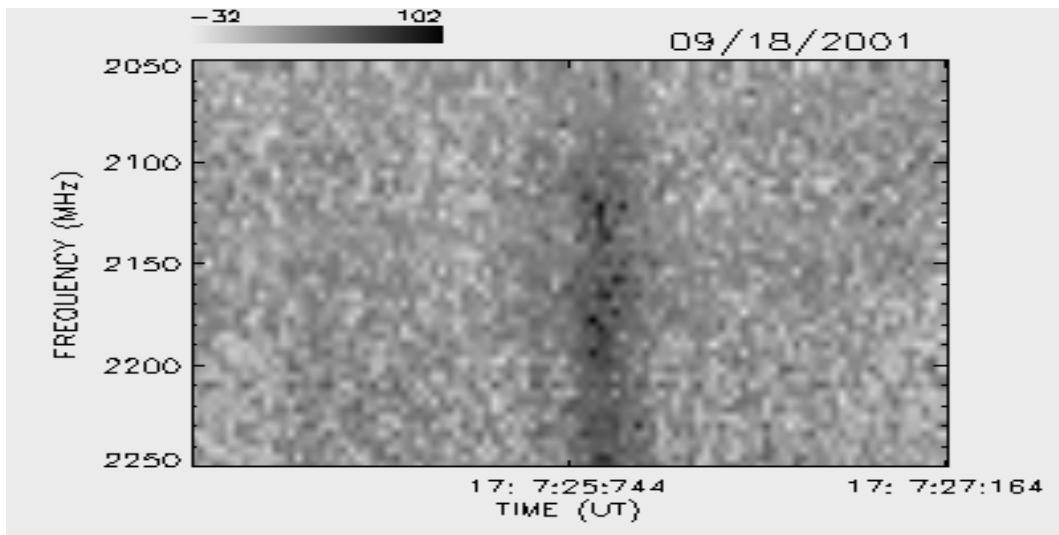
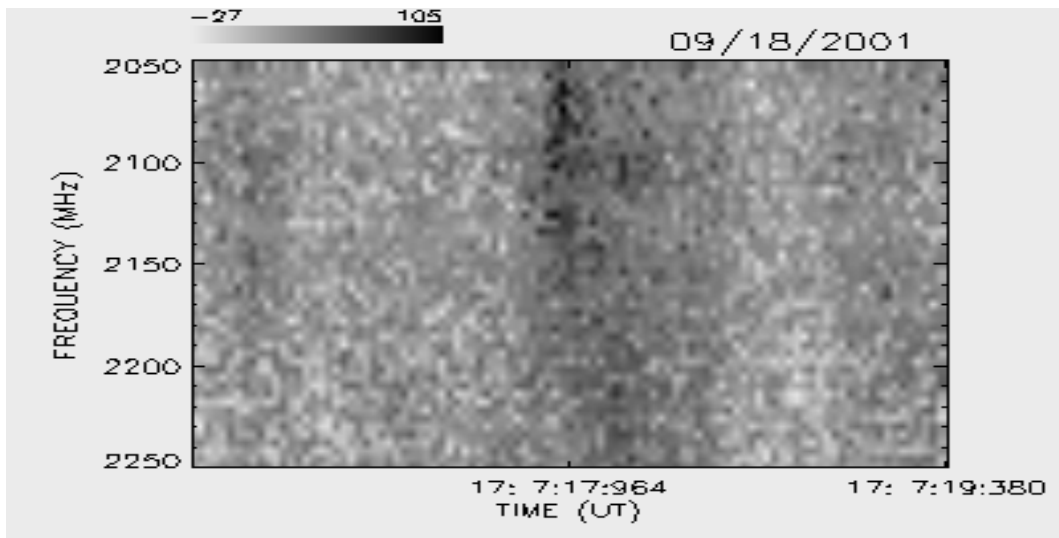
SETEMBRO / 2001



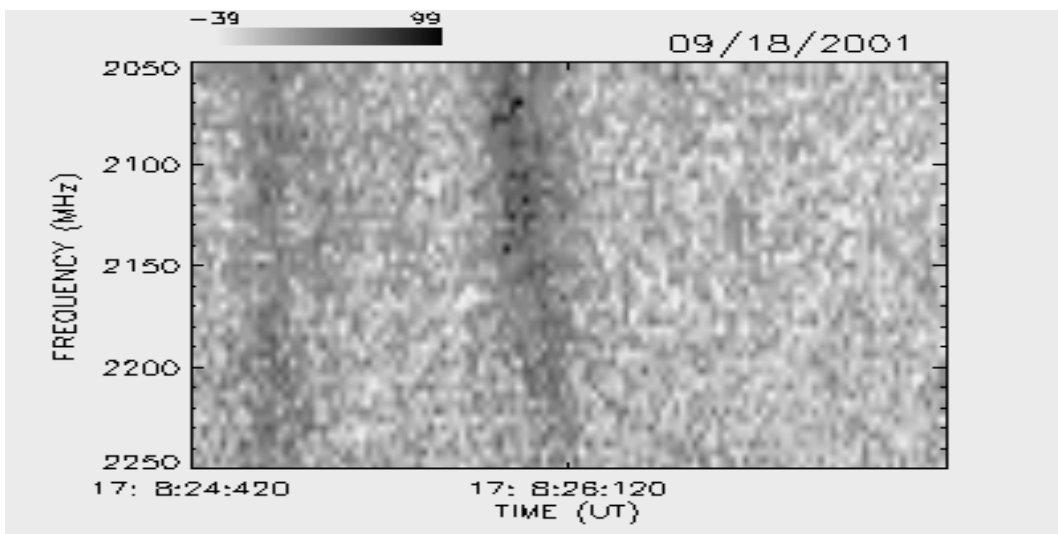
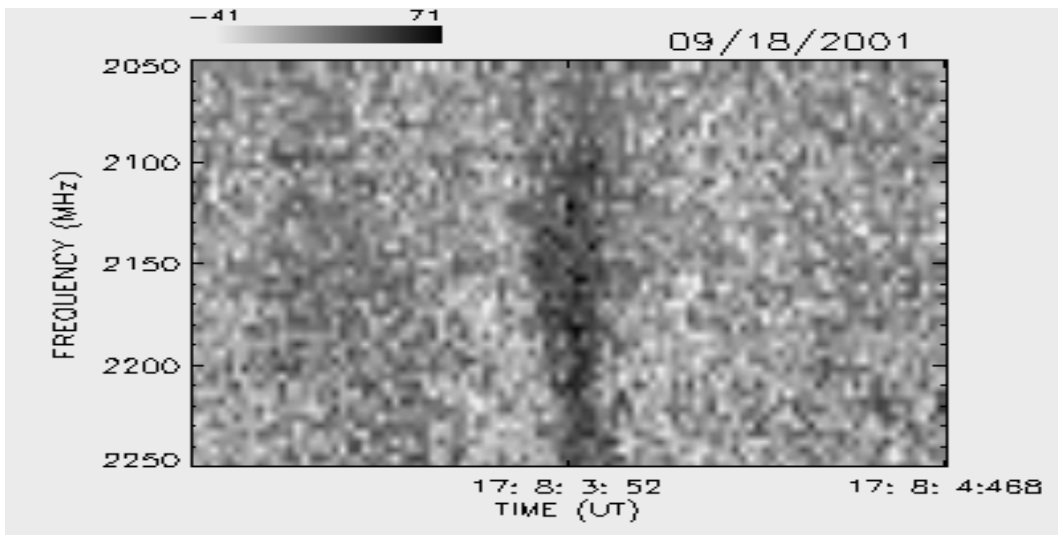
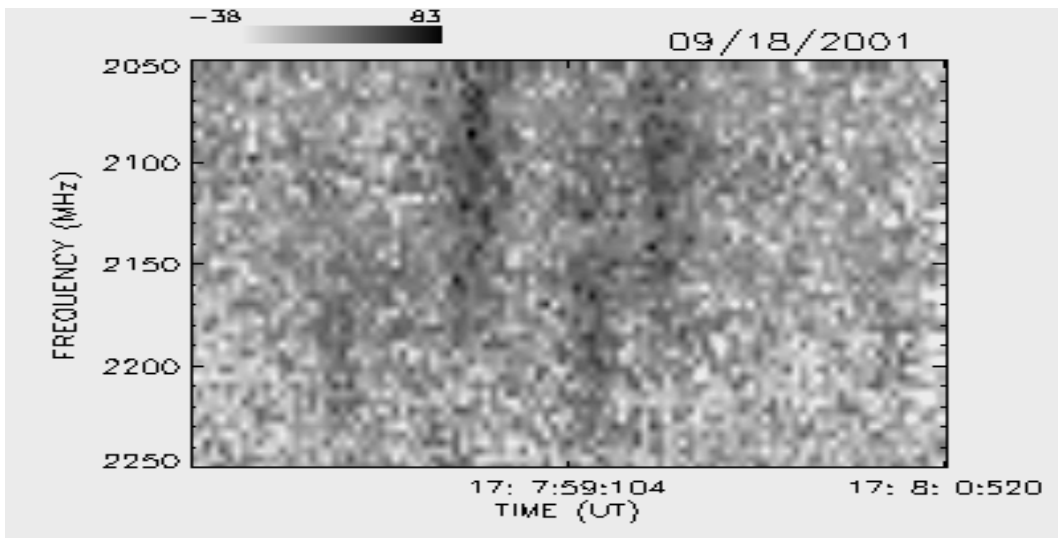
SETEMBRO / 2001



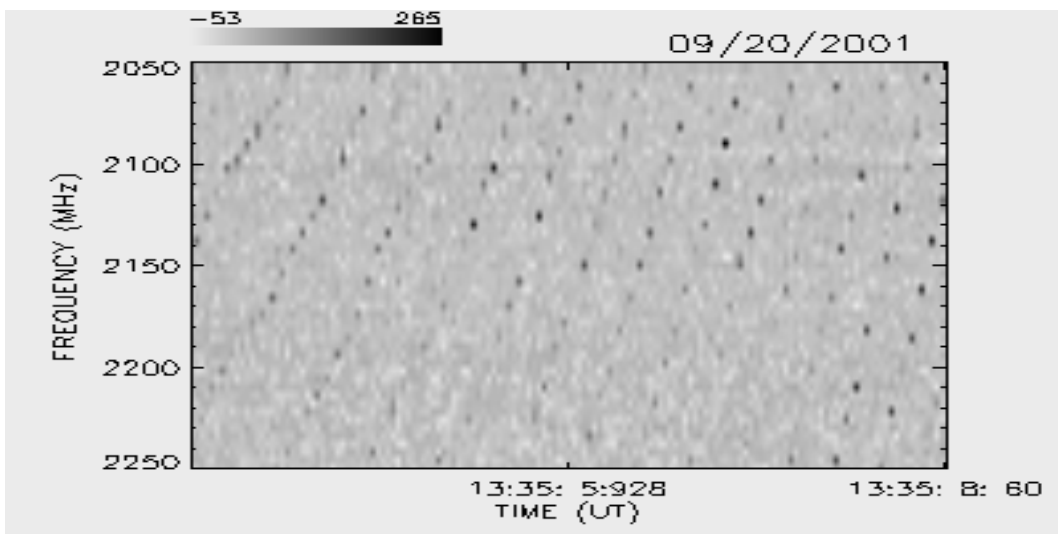
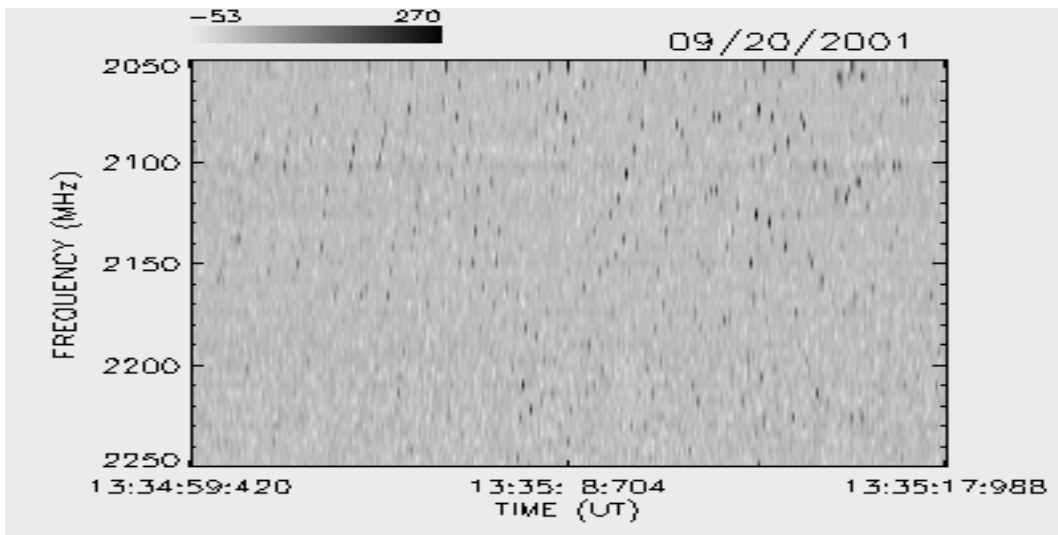
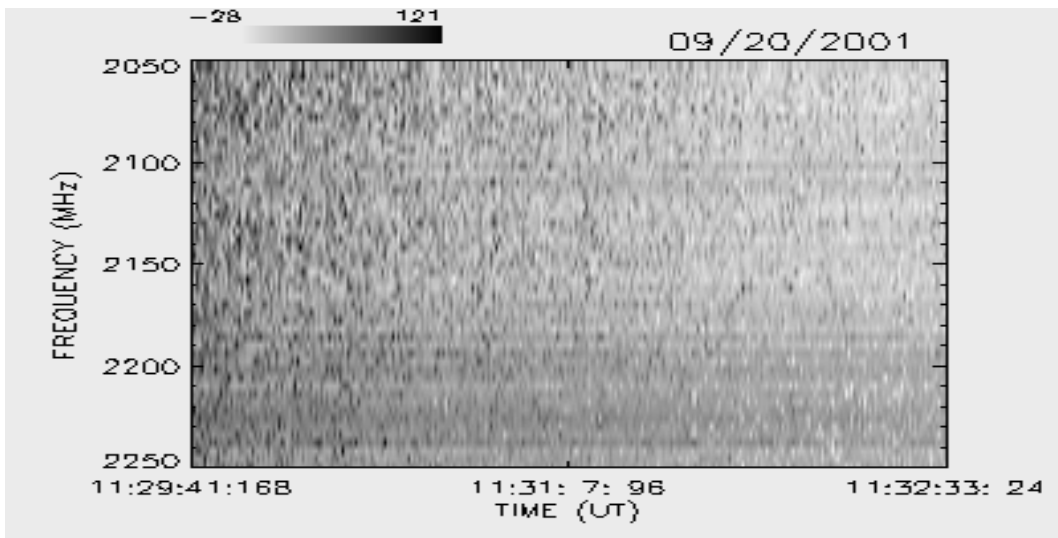
SETEMBRO / 2001



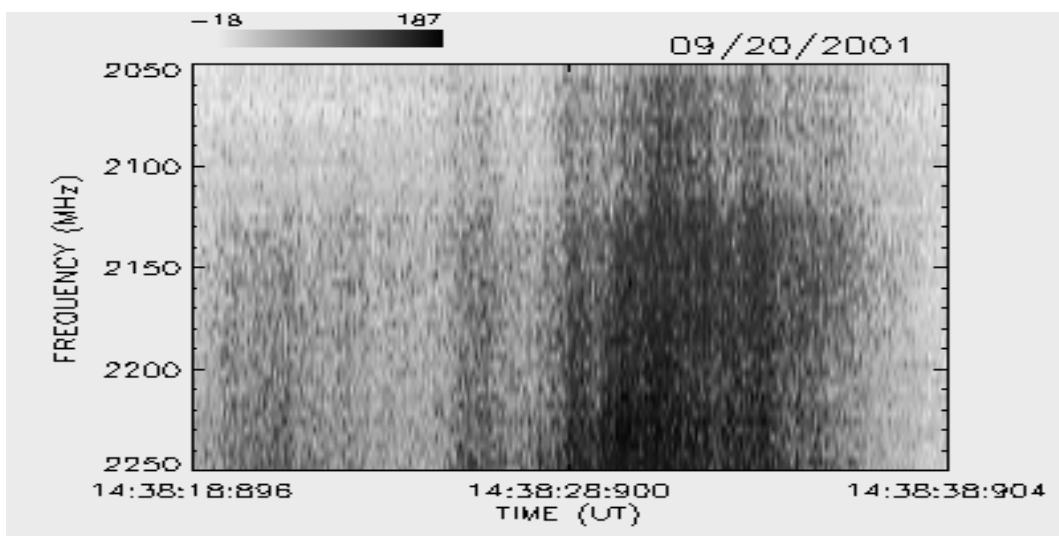
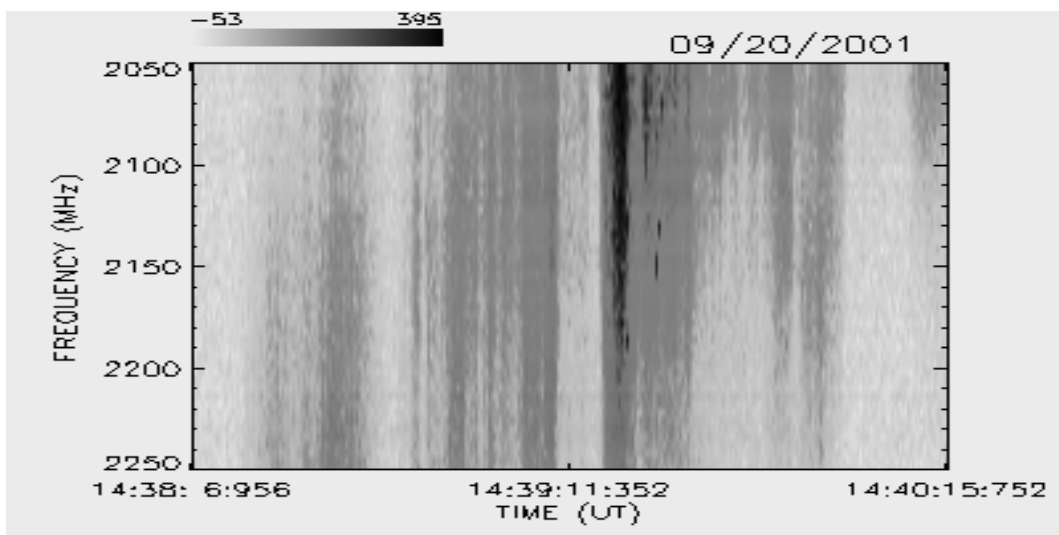
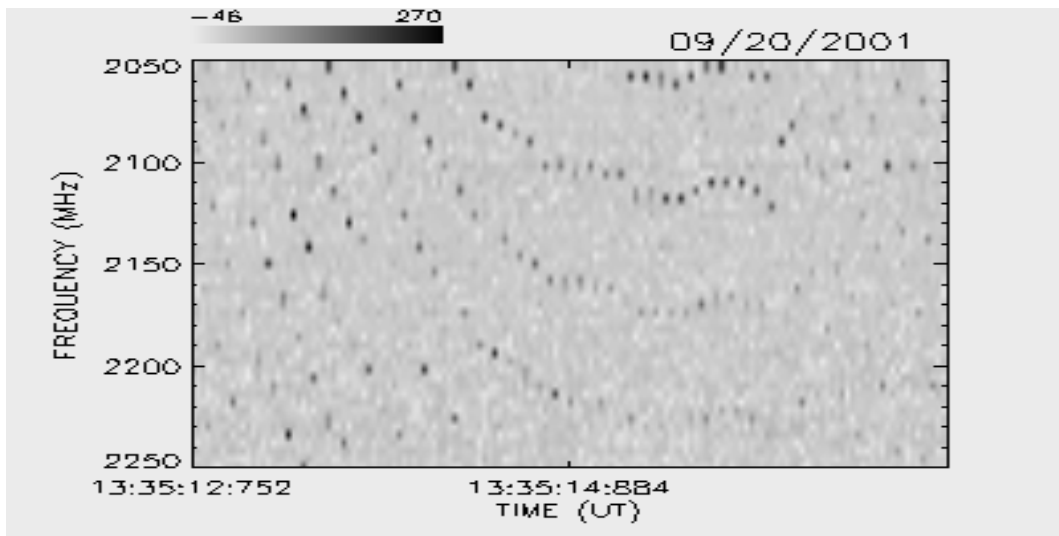
SETEMBRO / 2001



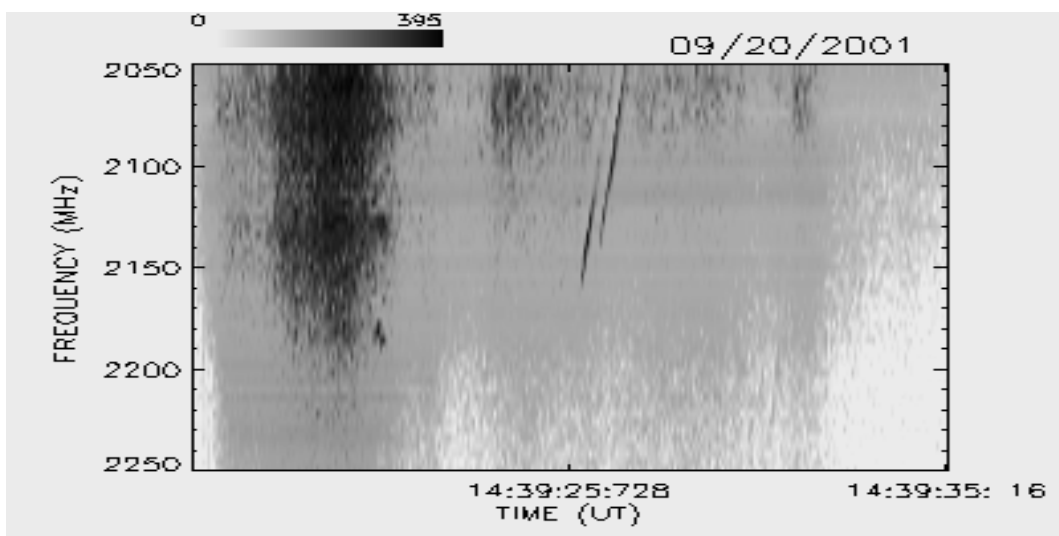
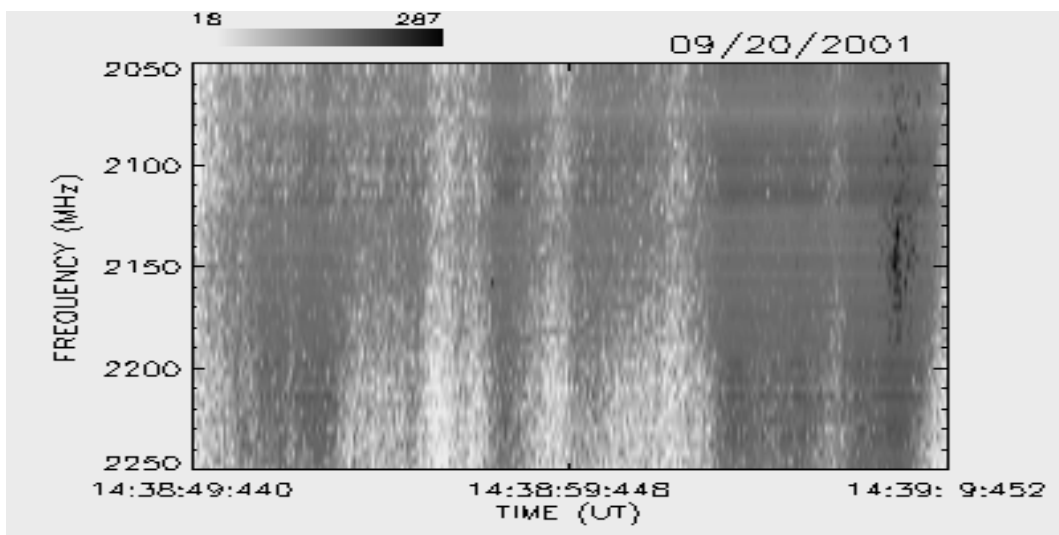
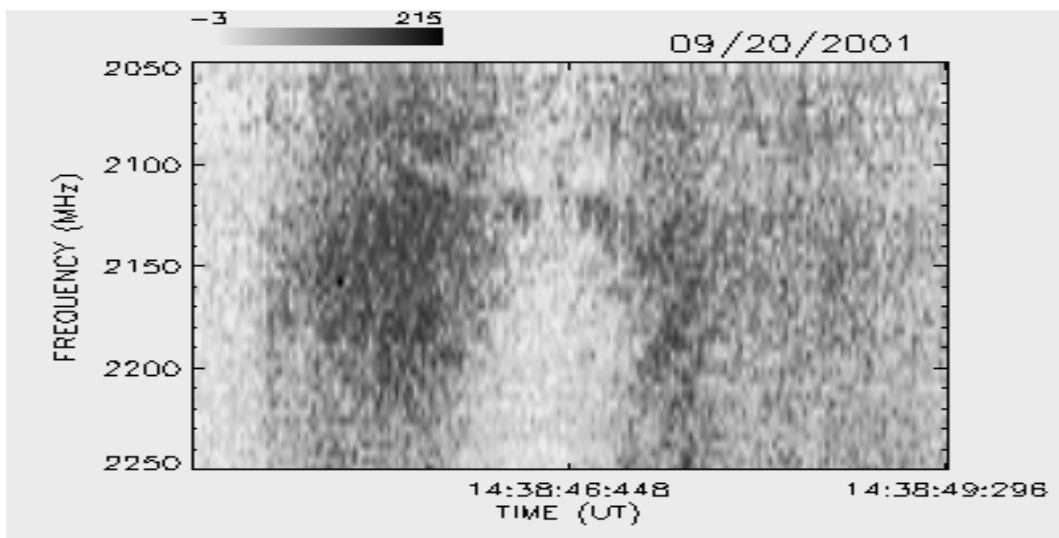
SETEMBRO / 2001



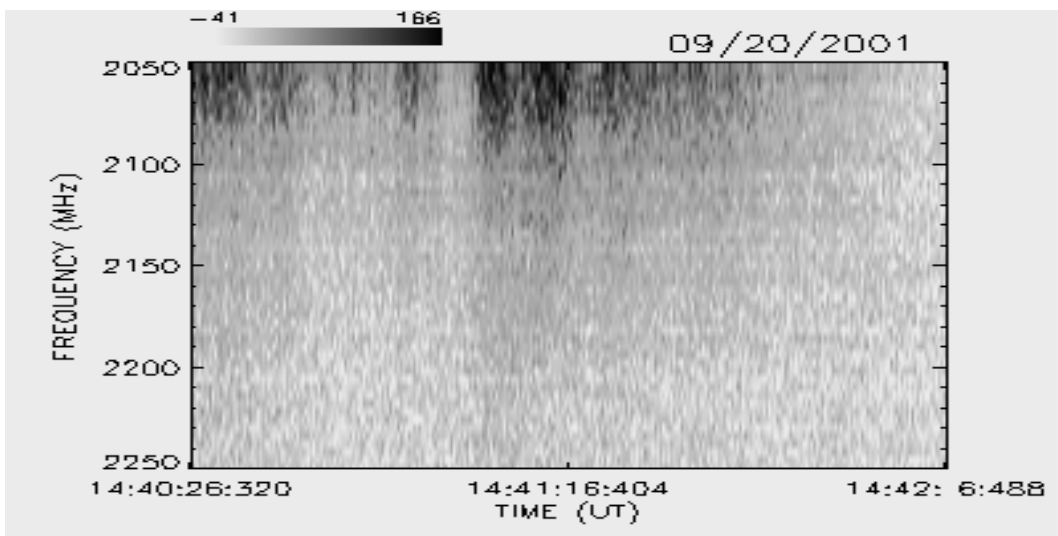
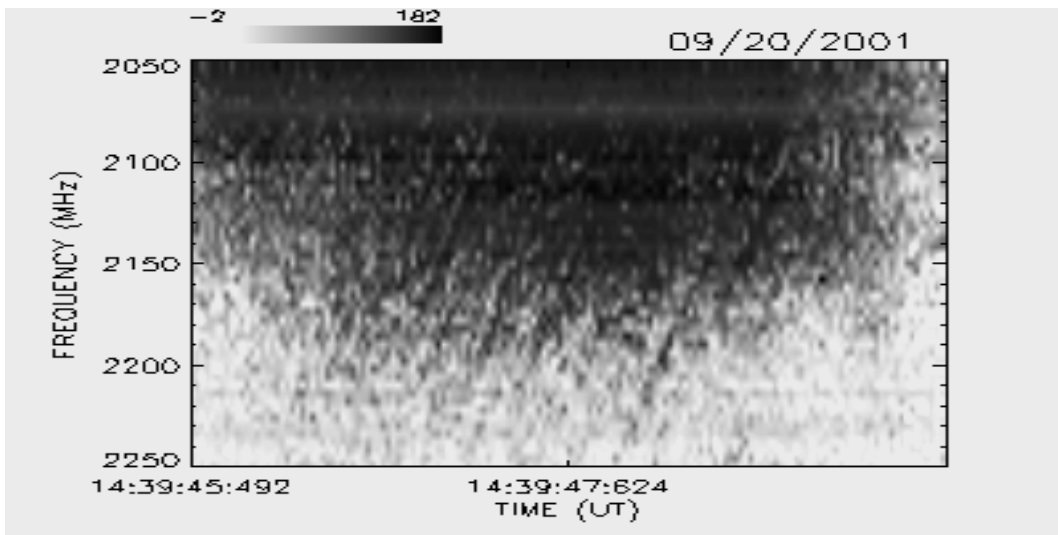
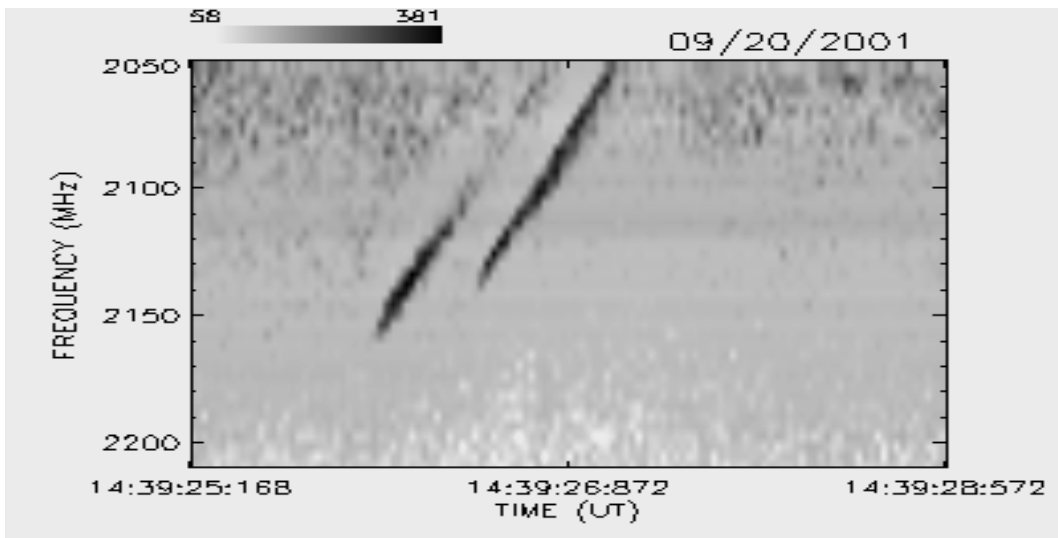
SETEMBRO / 2001



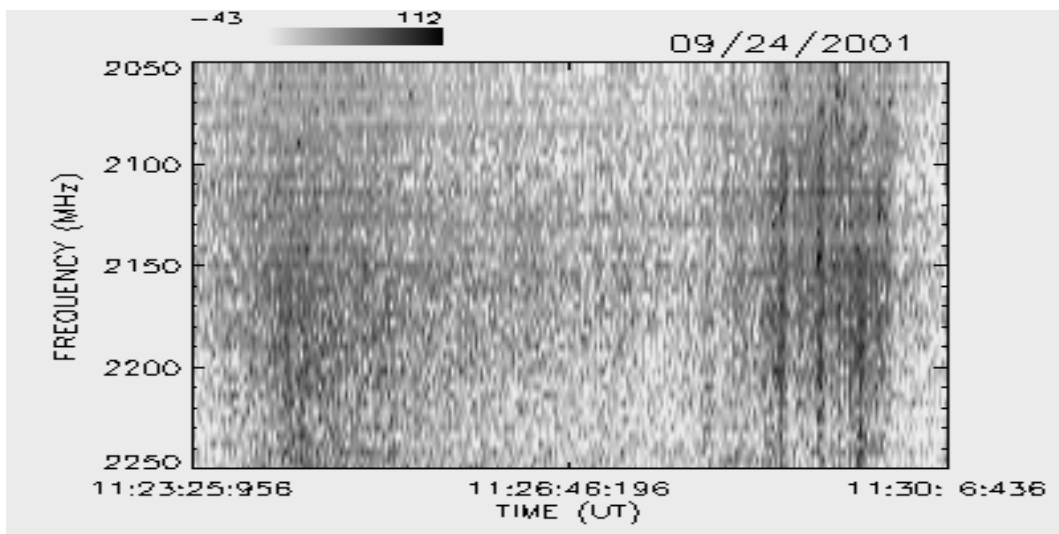
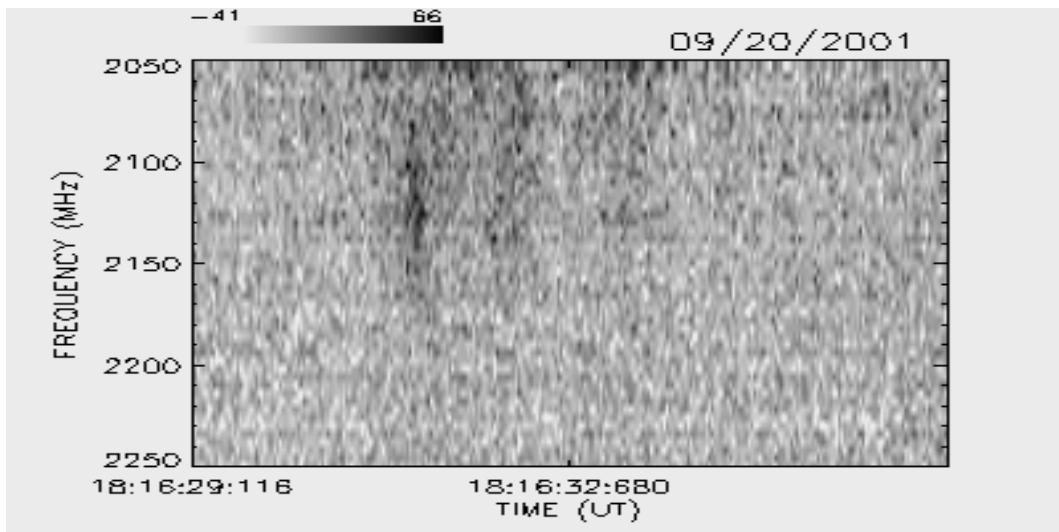
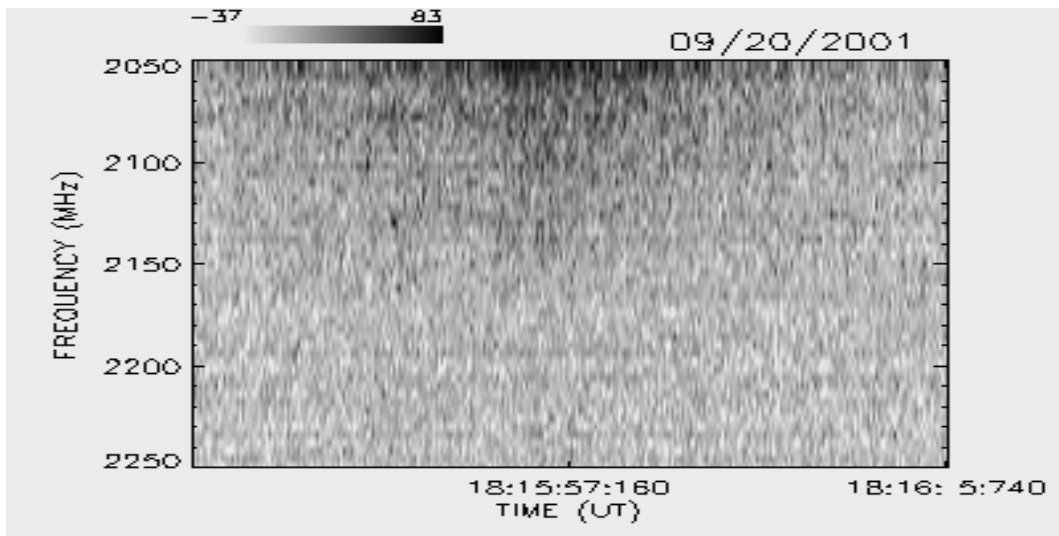
SETEMBRO / 2001



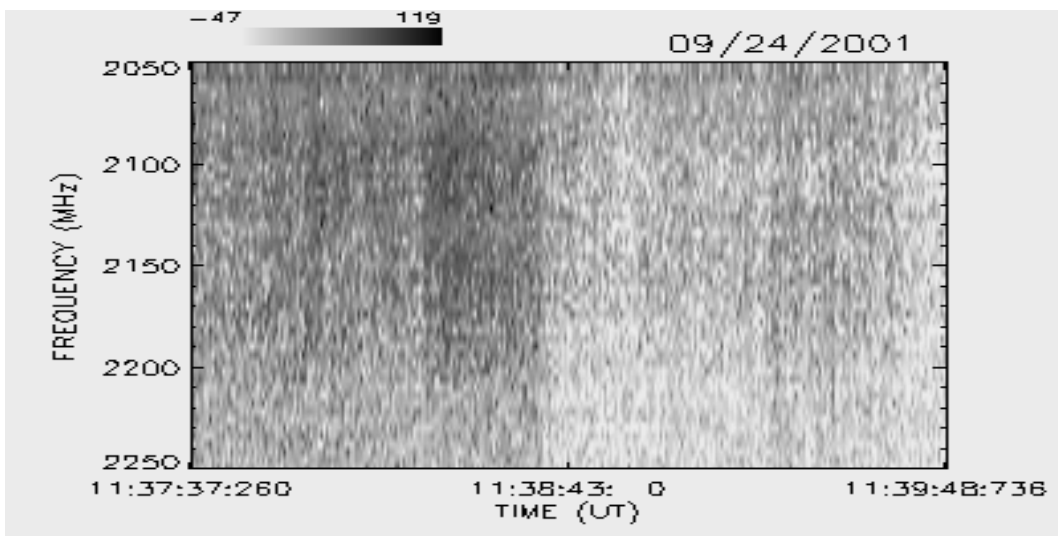
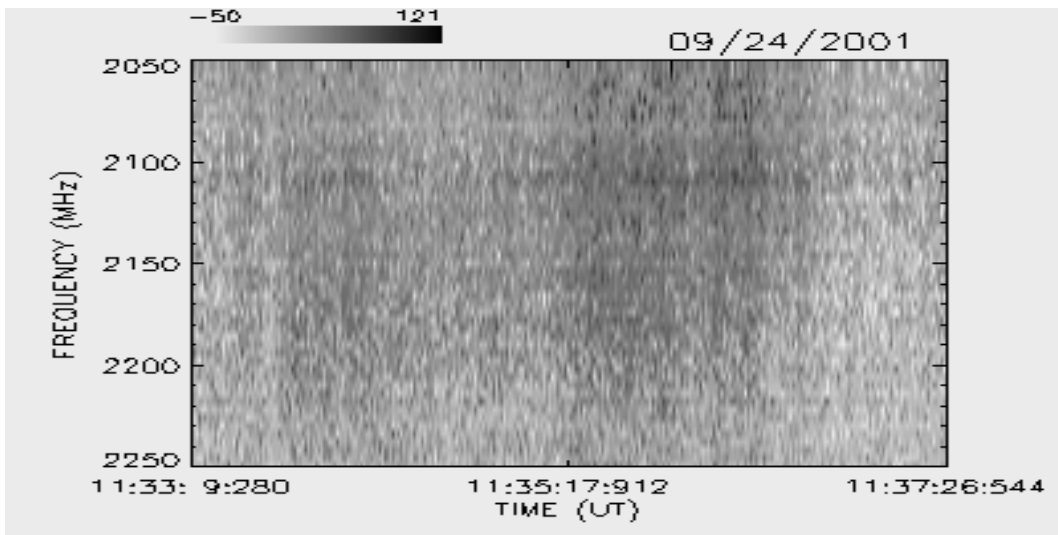
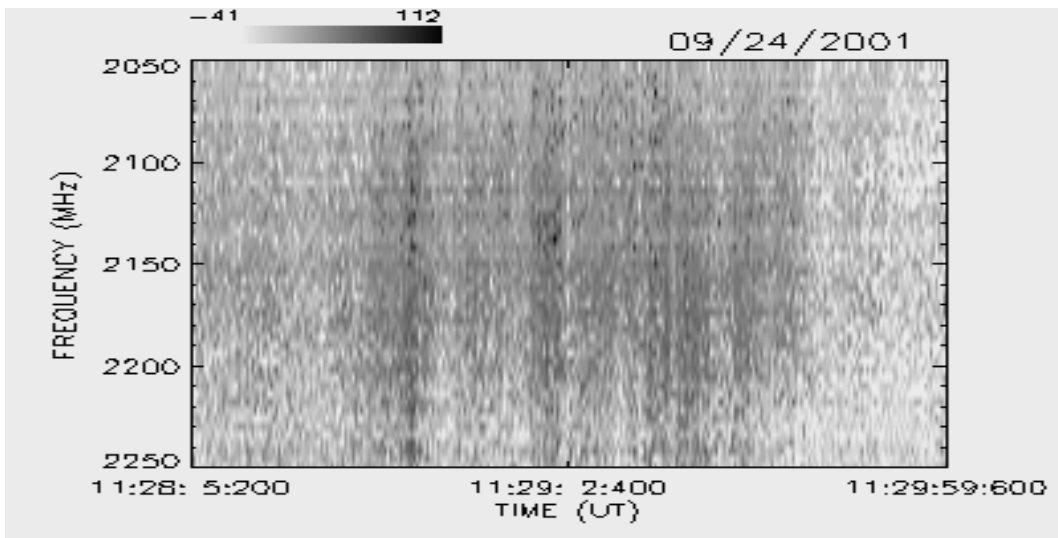
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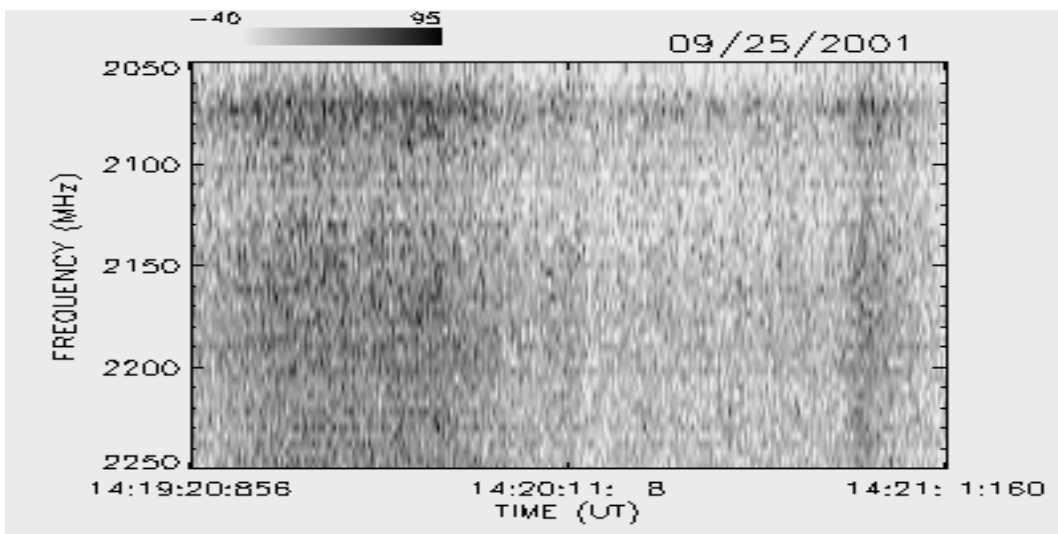
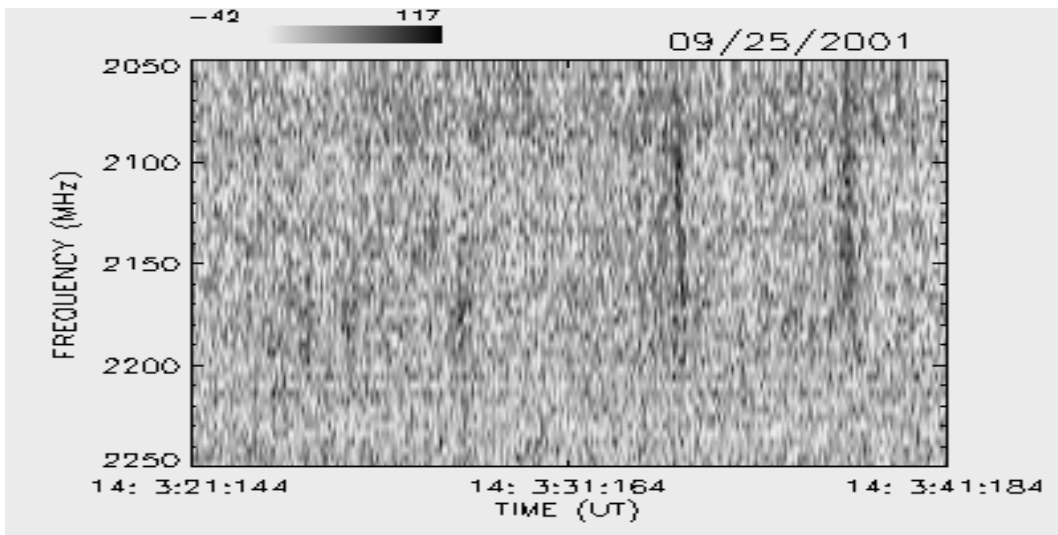
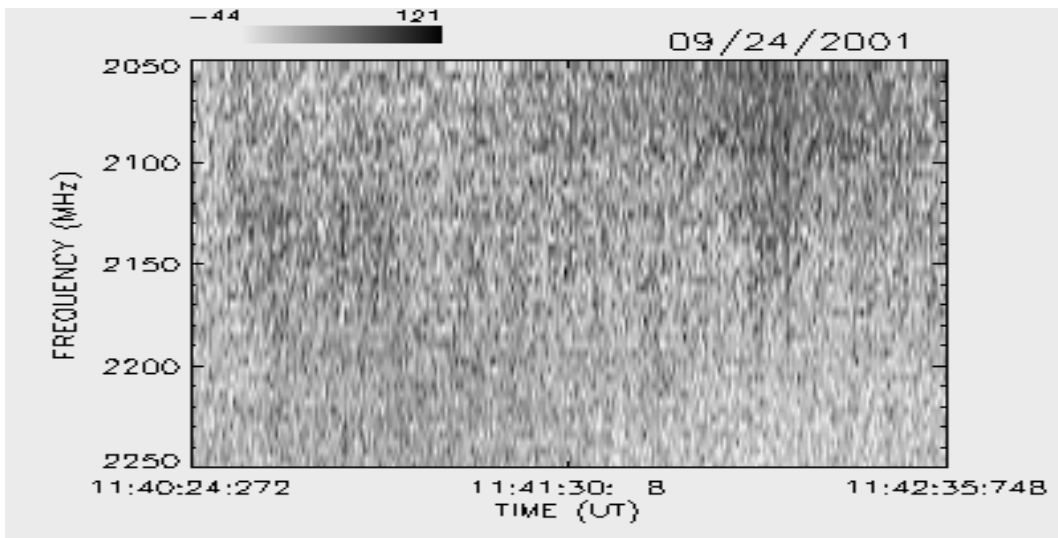
SETEMBRO / 2001



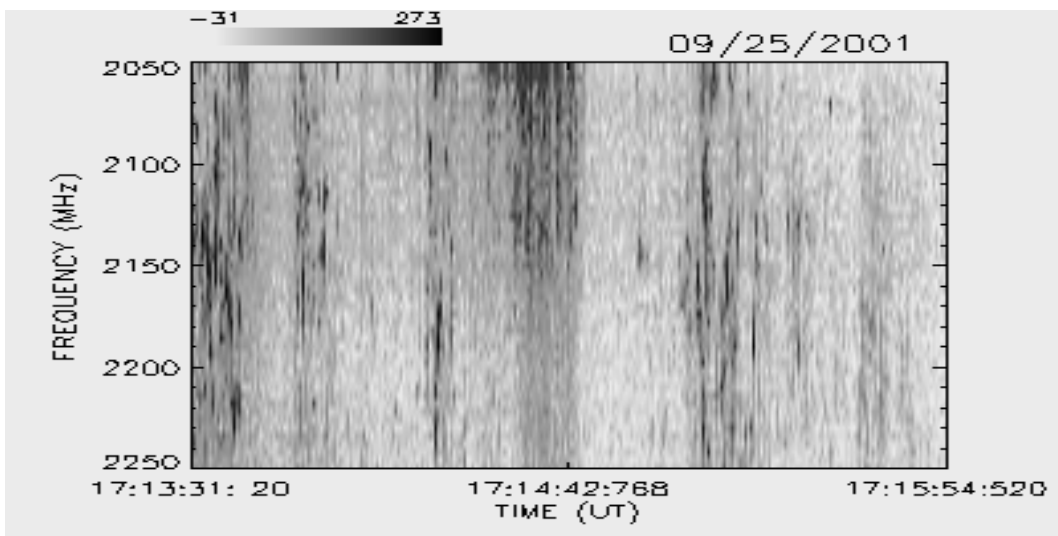
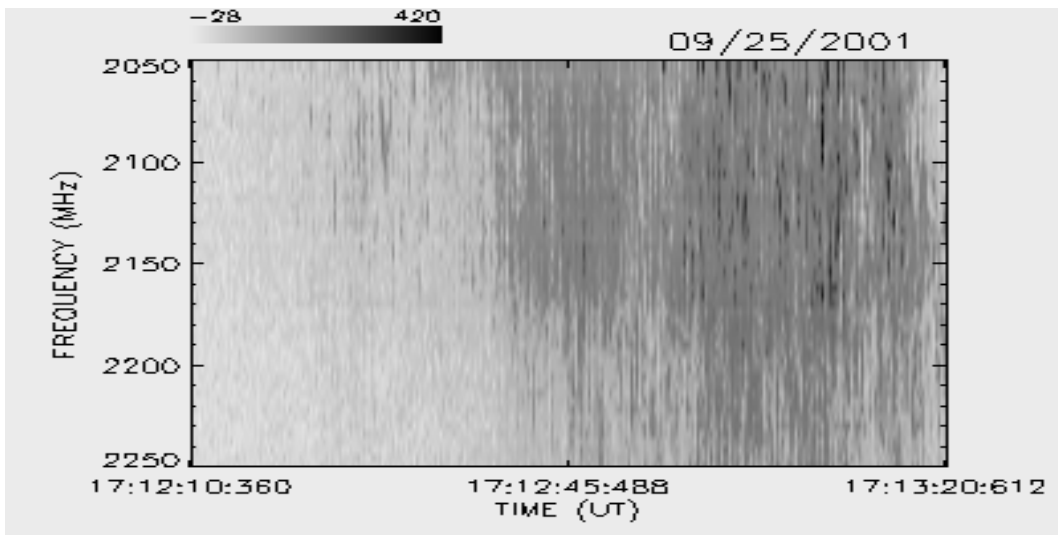
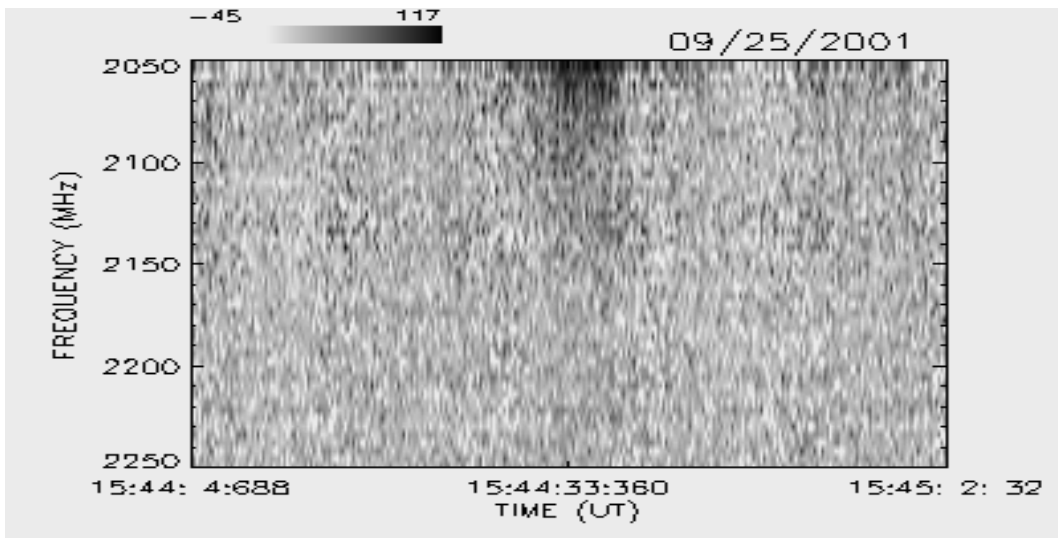
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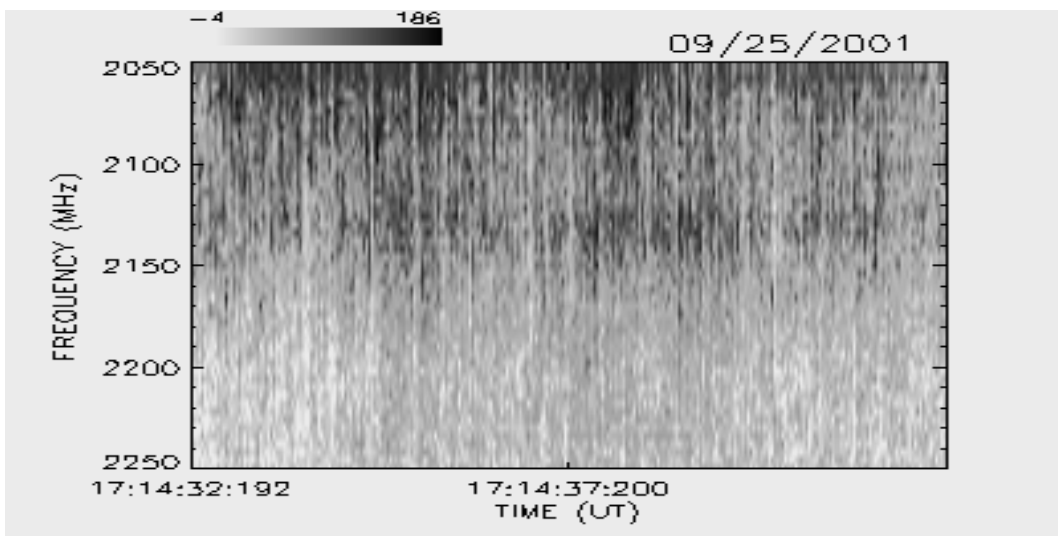
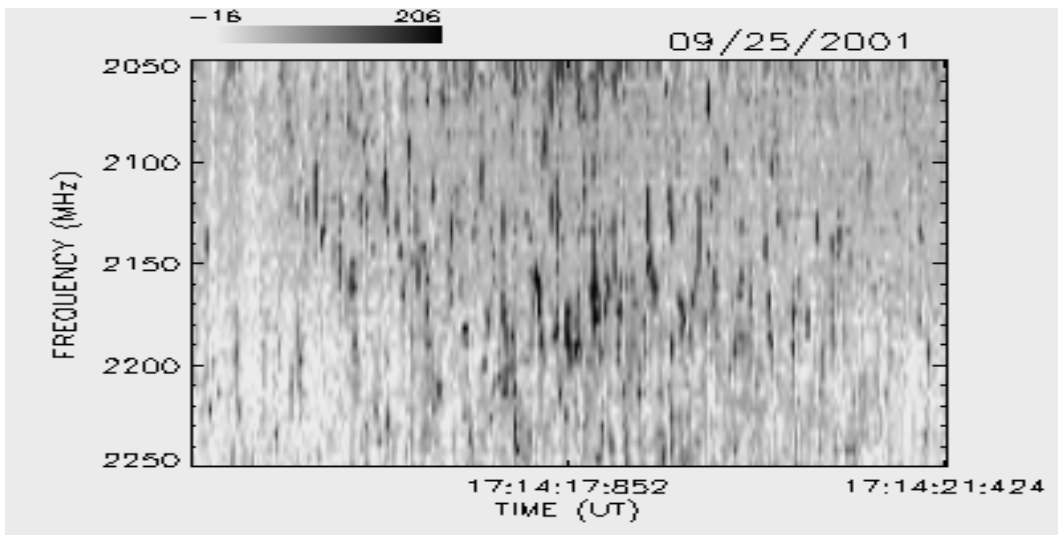
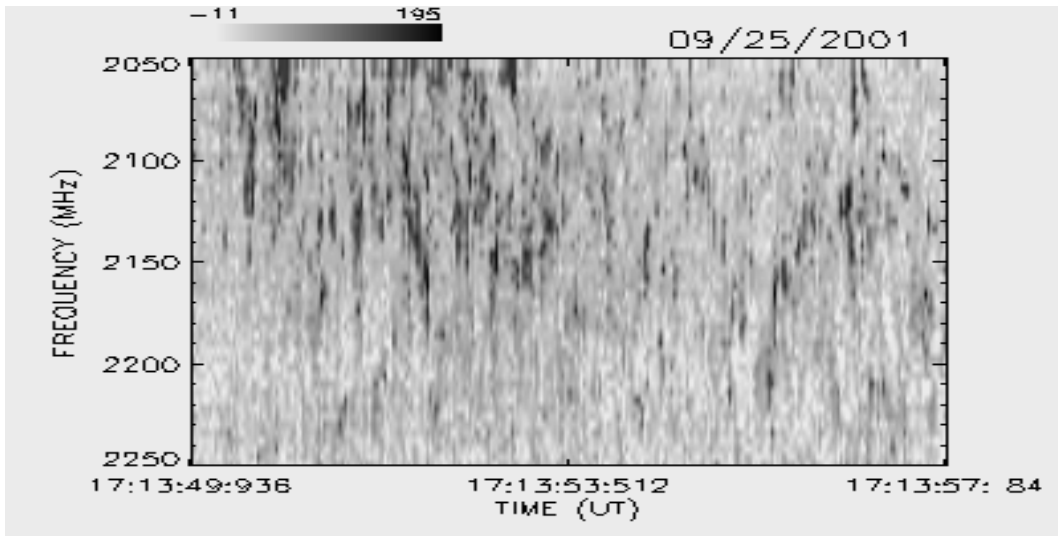
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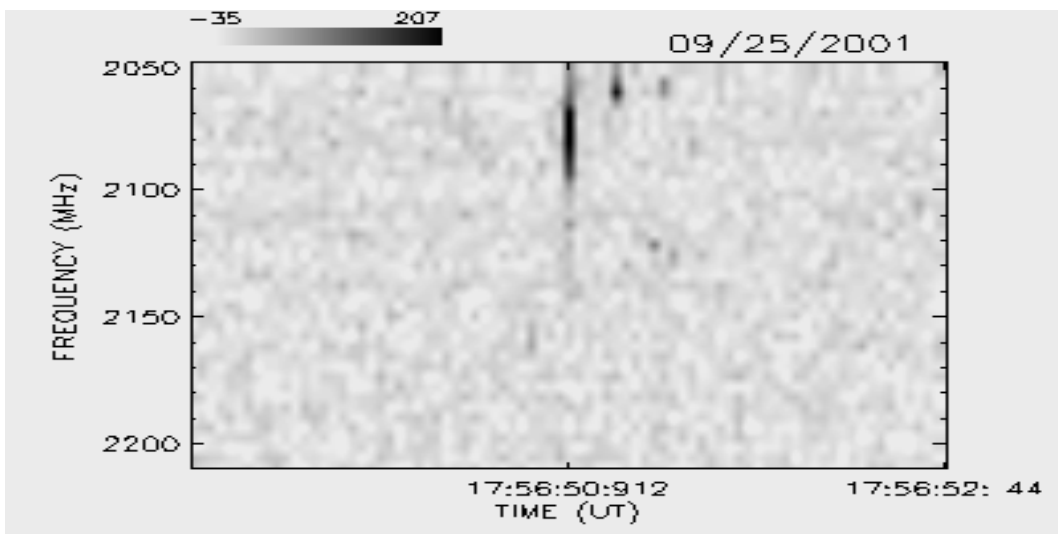
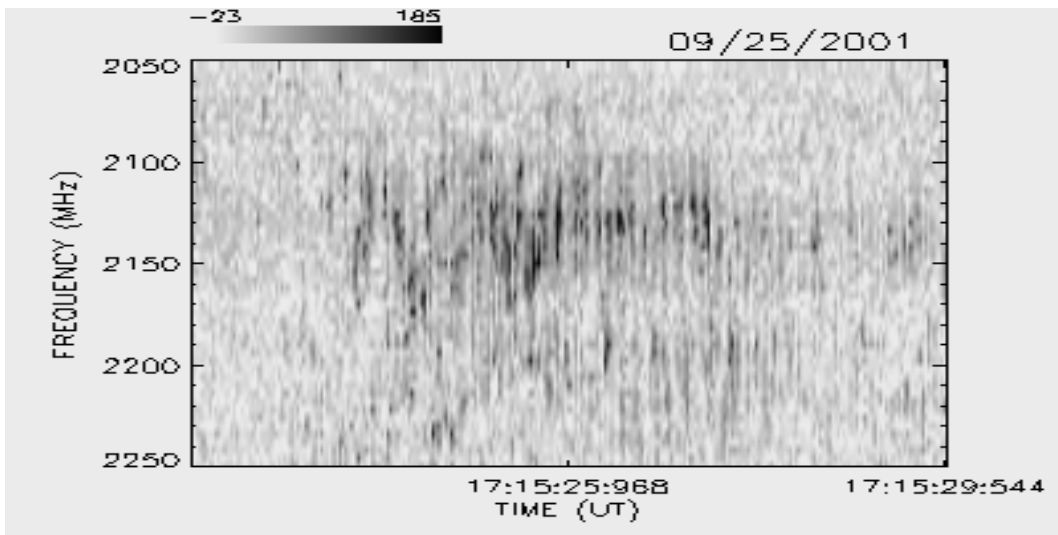
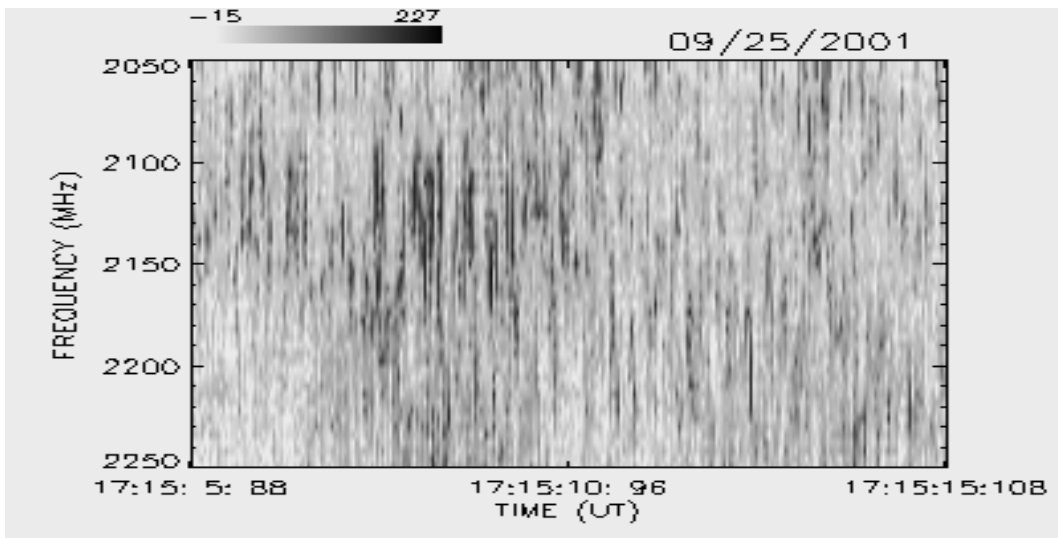
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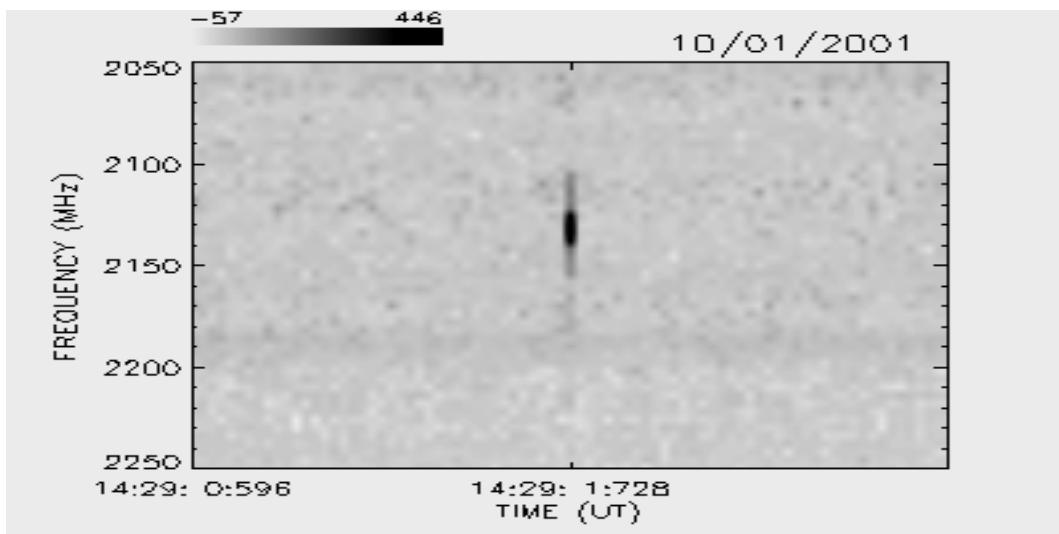
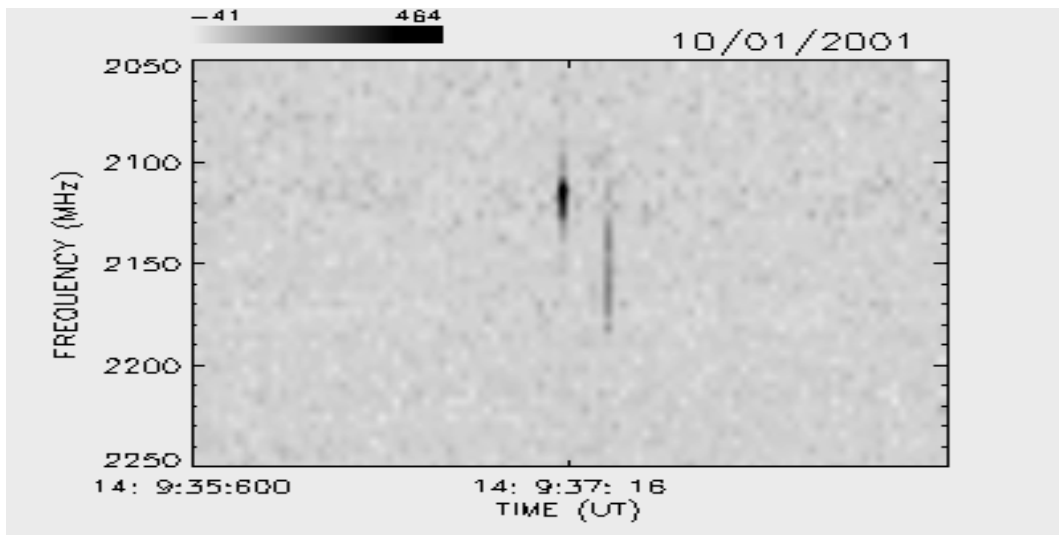
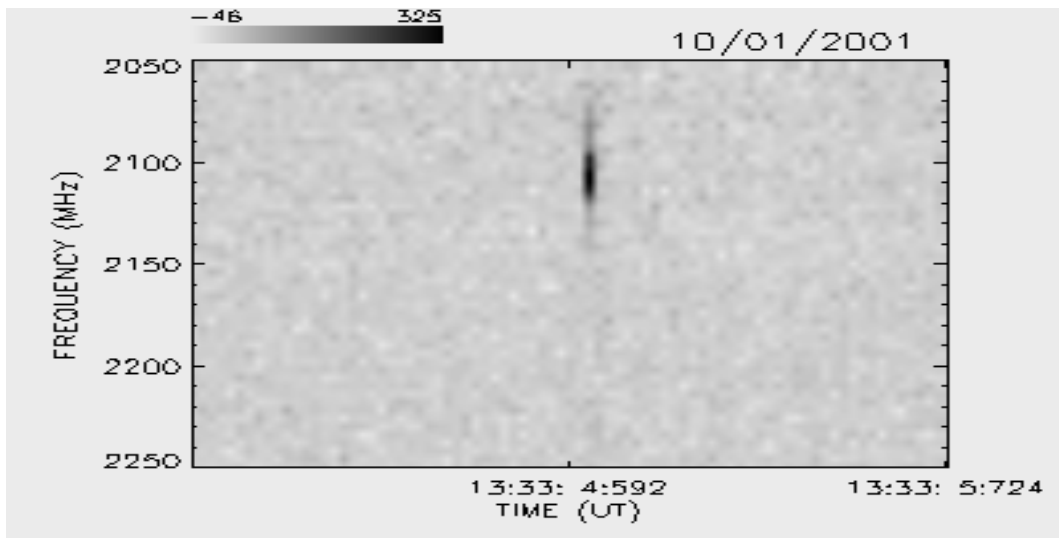
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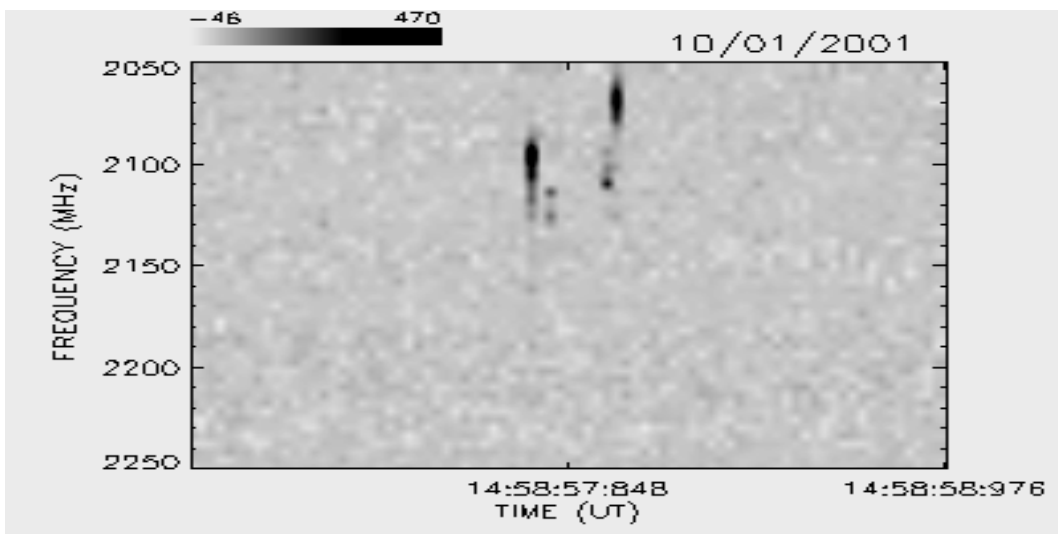
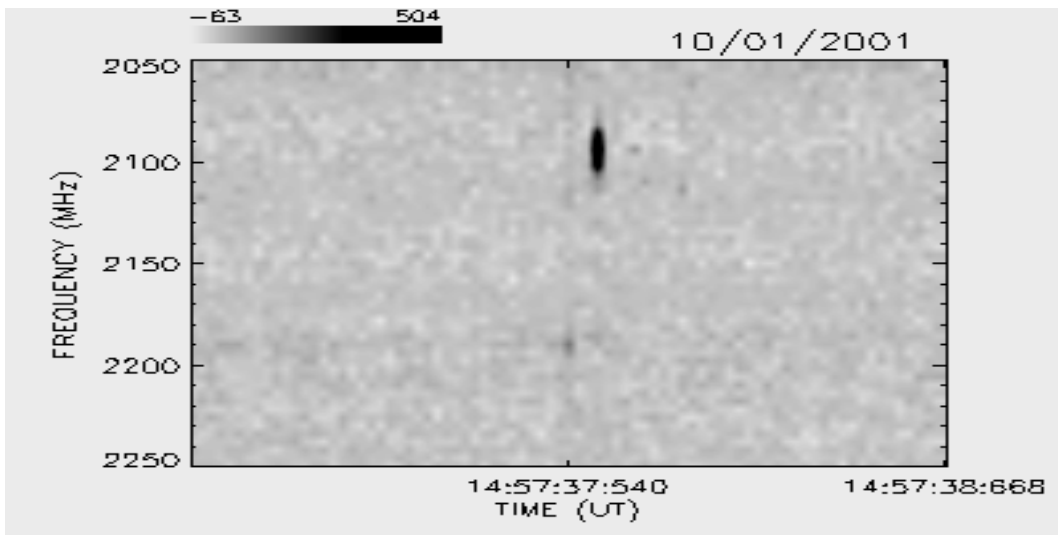
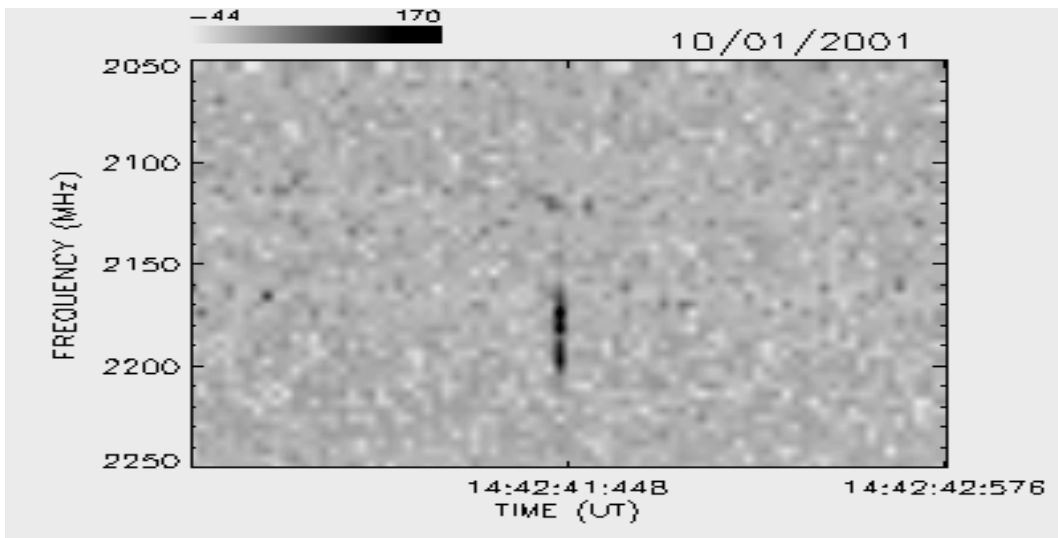
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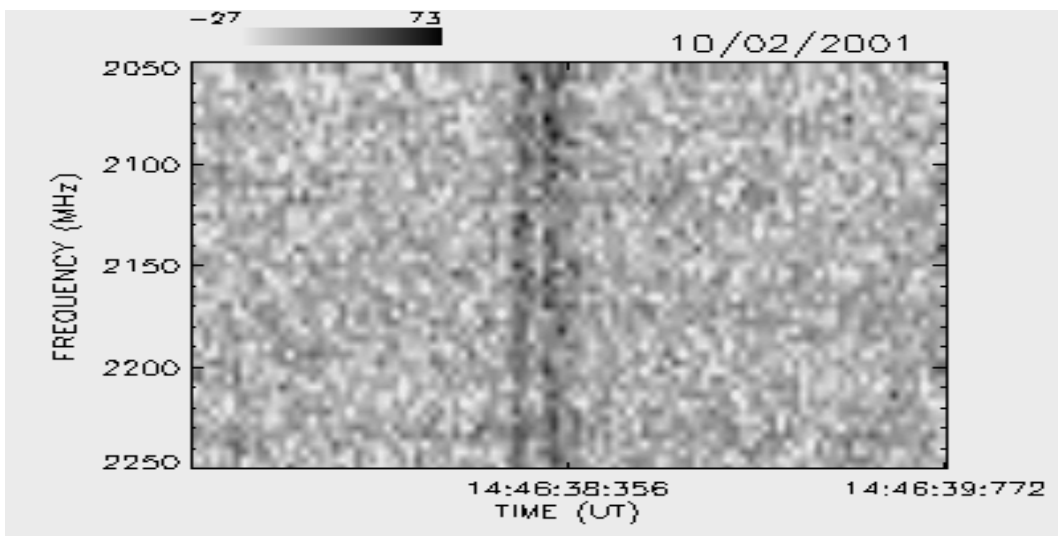
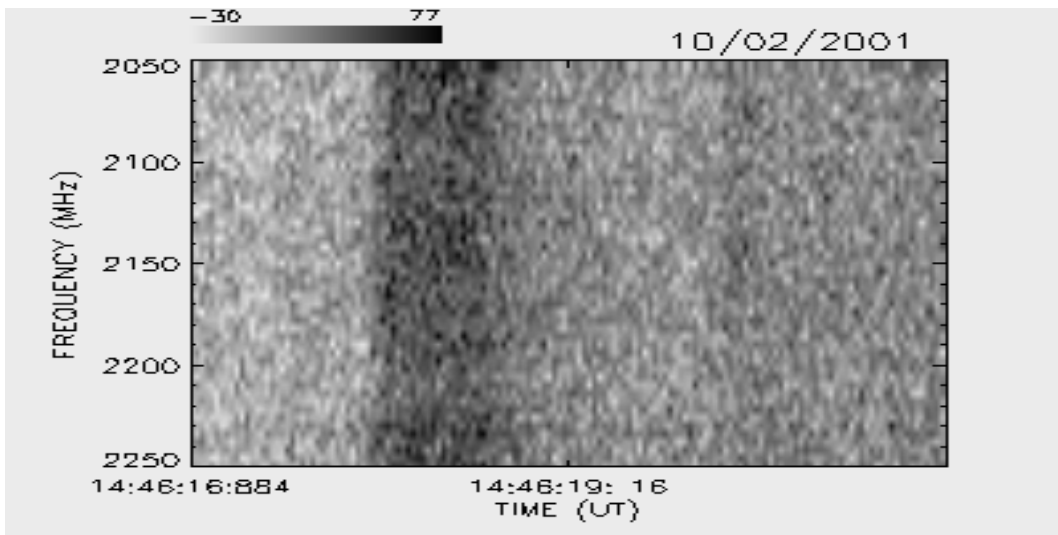
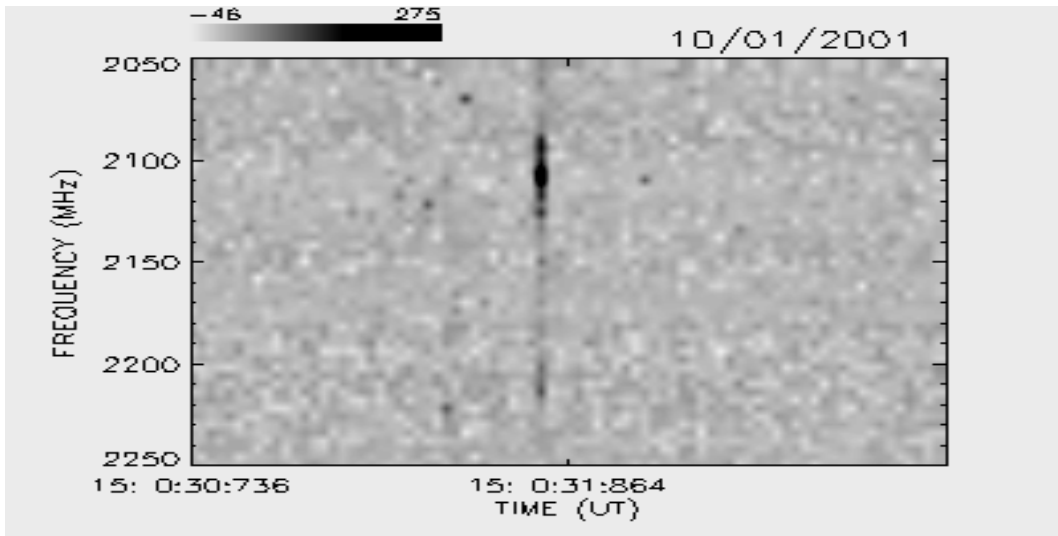
OUTUBRO / 2001



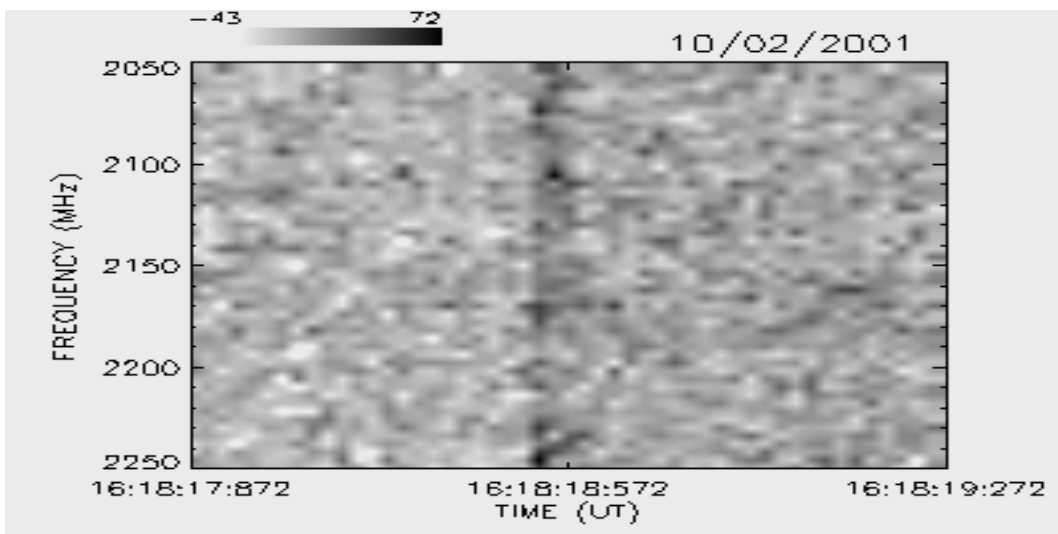
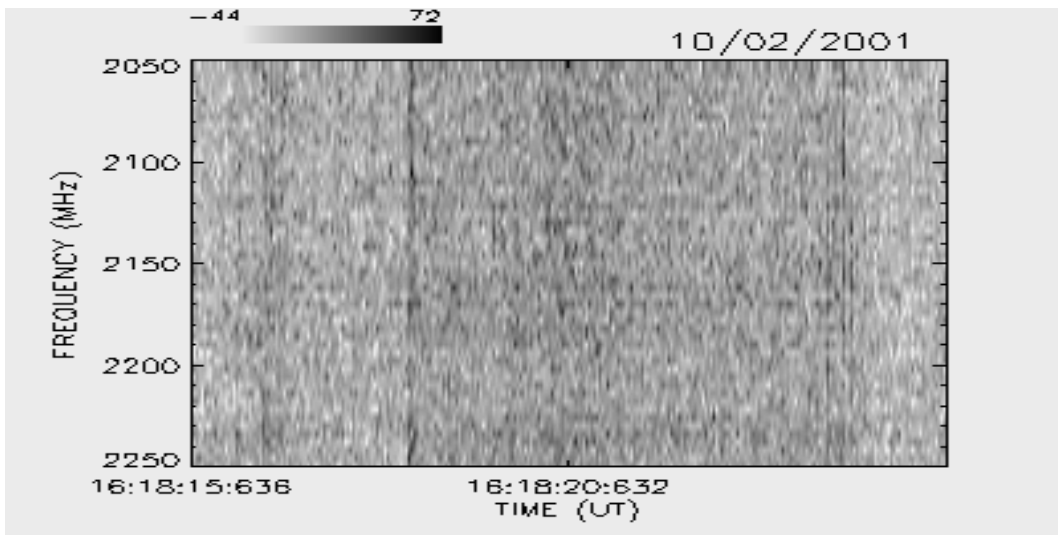
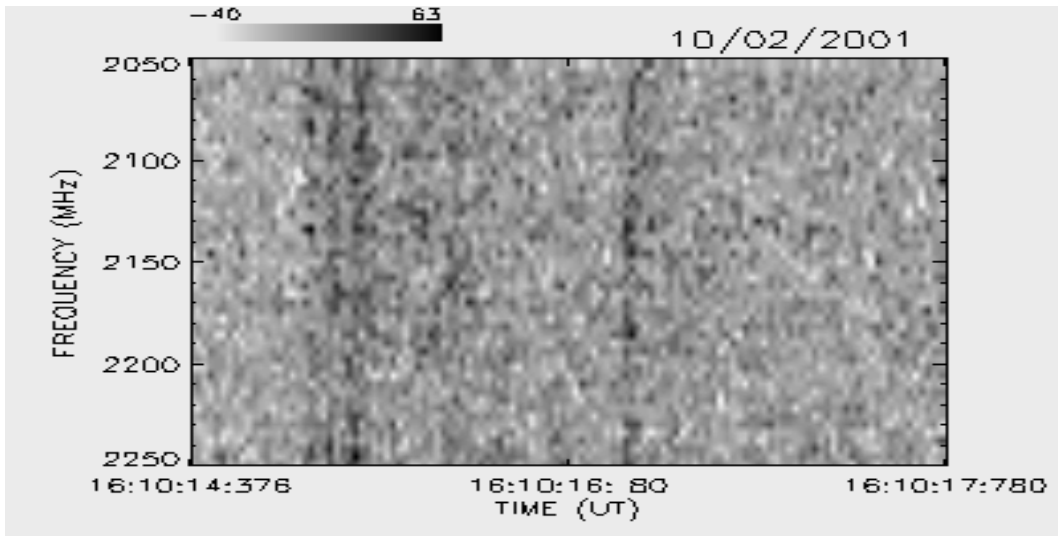
OUTUBRO / 2001



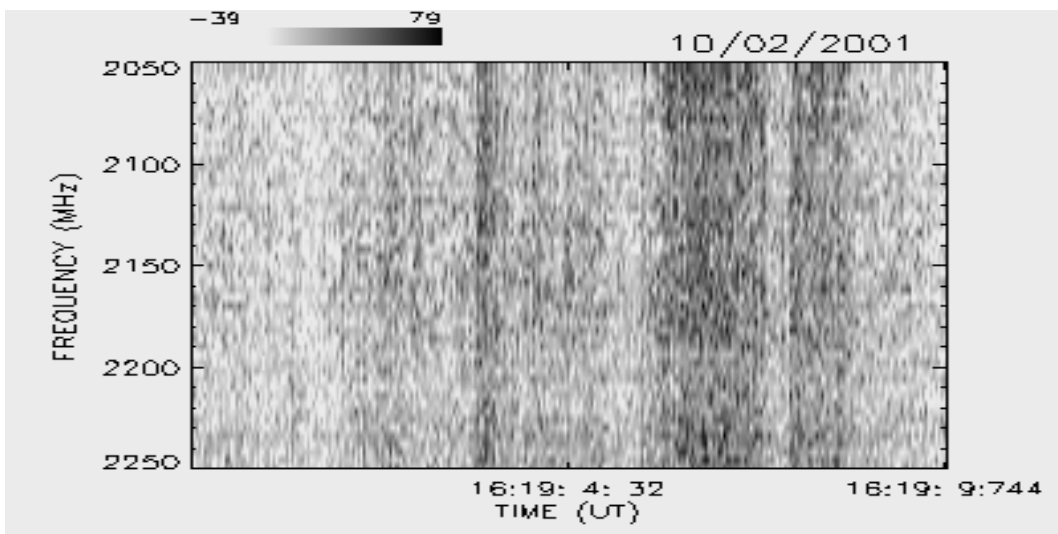
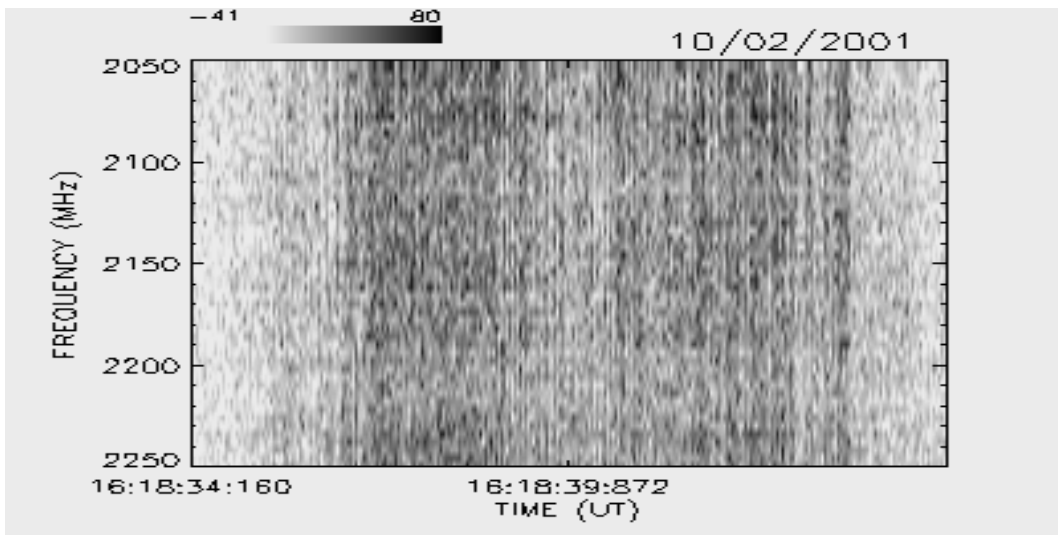
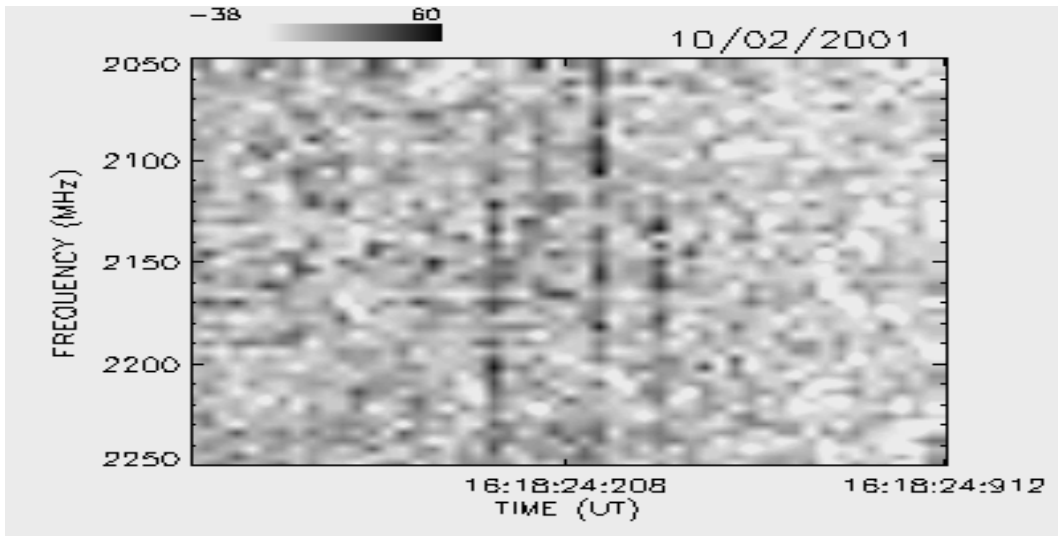
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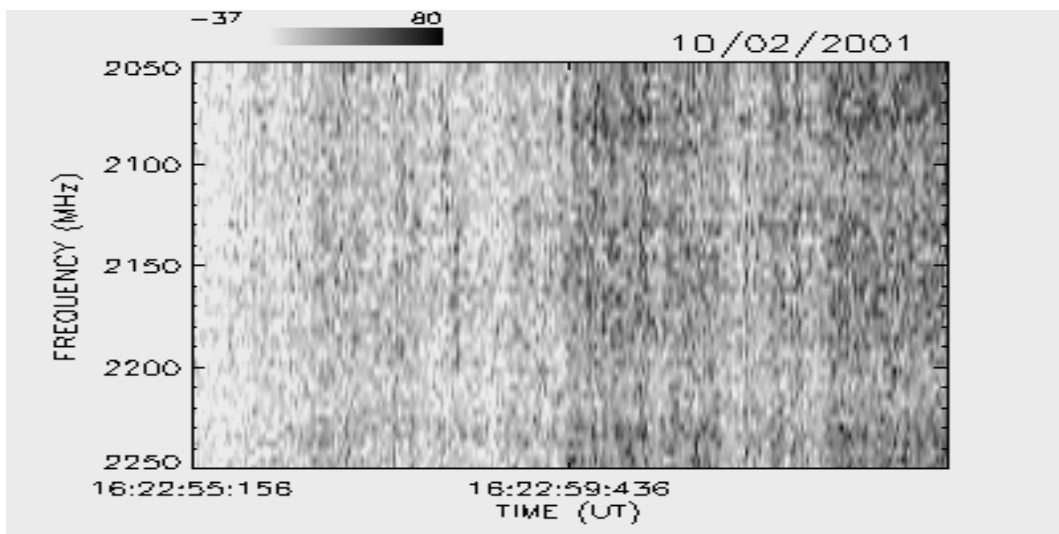
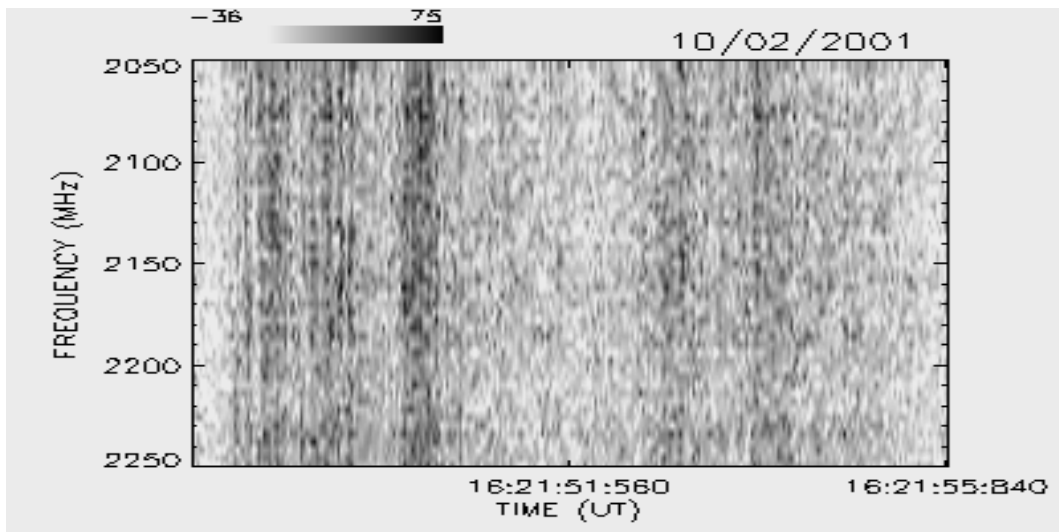
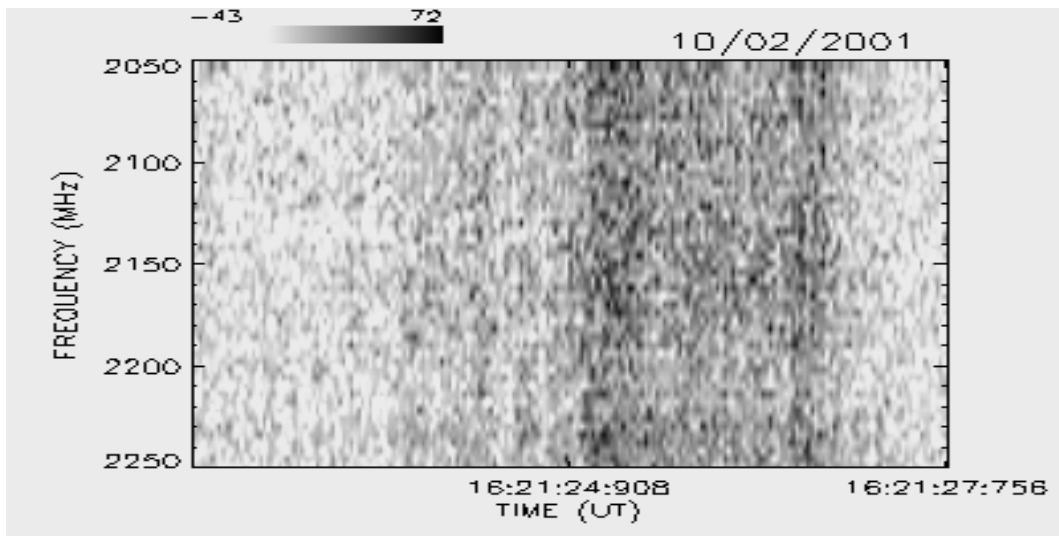
OUTUBRO / 2001



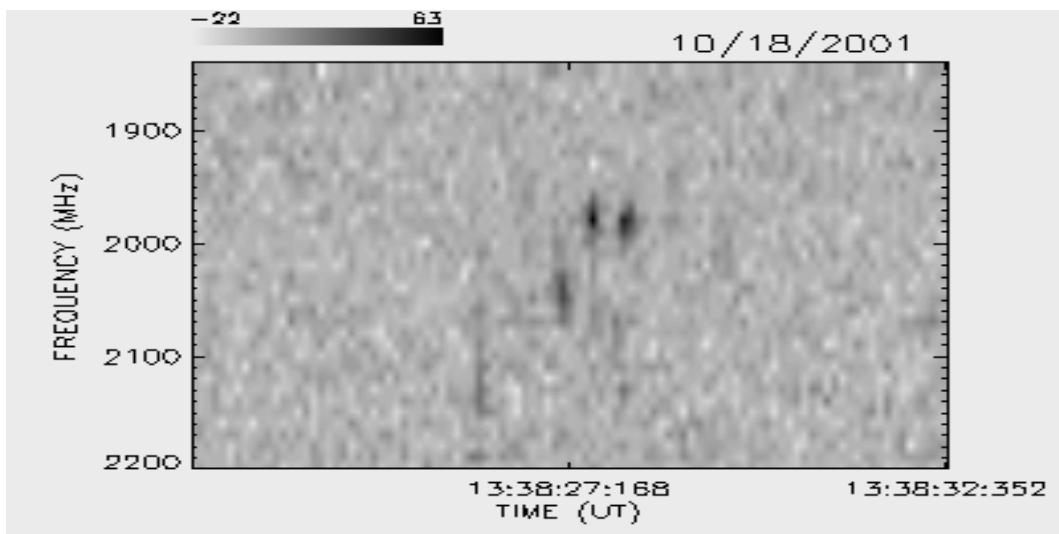
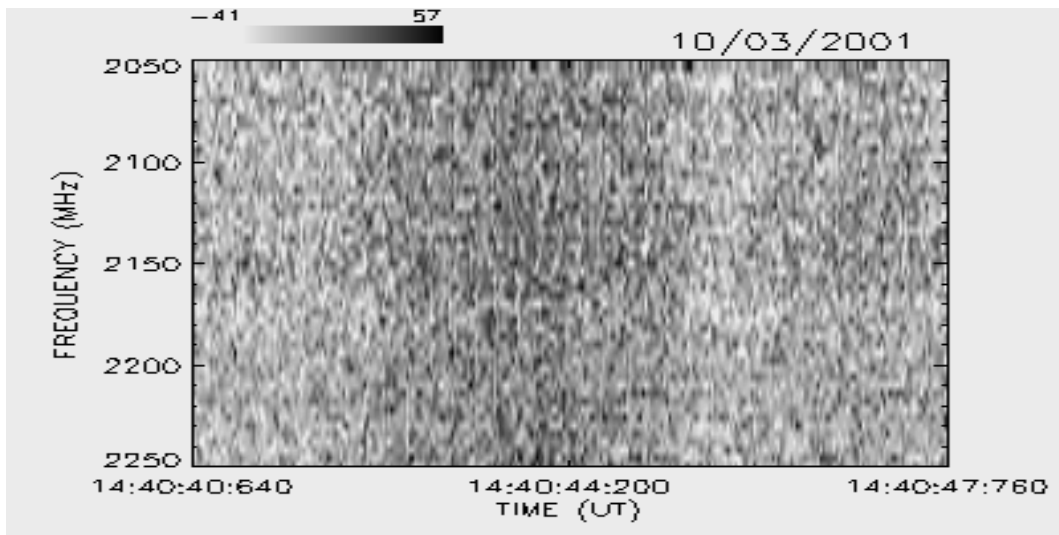
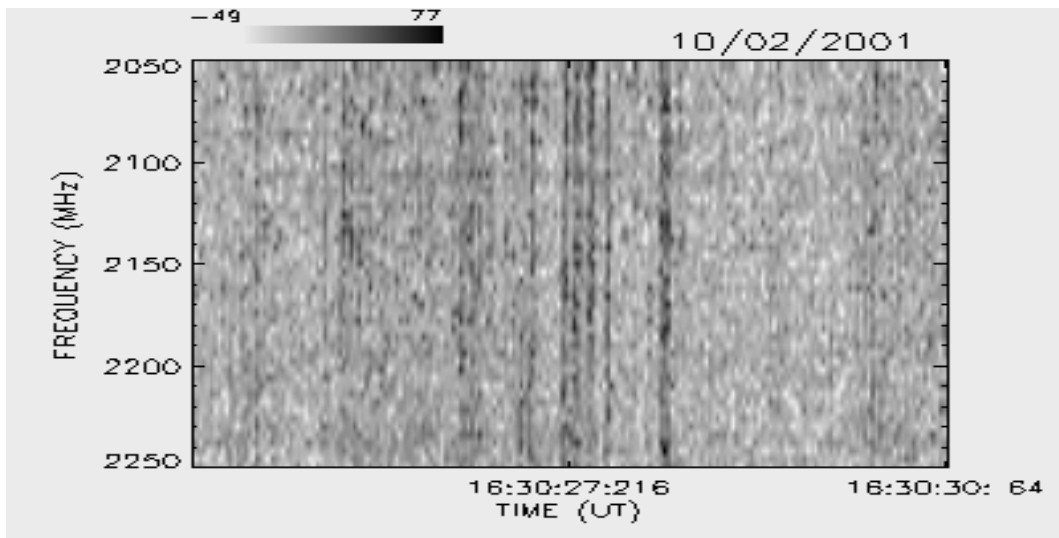
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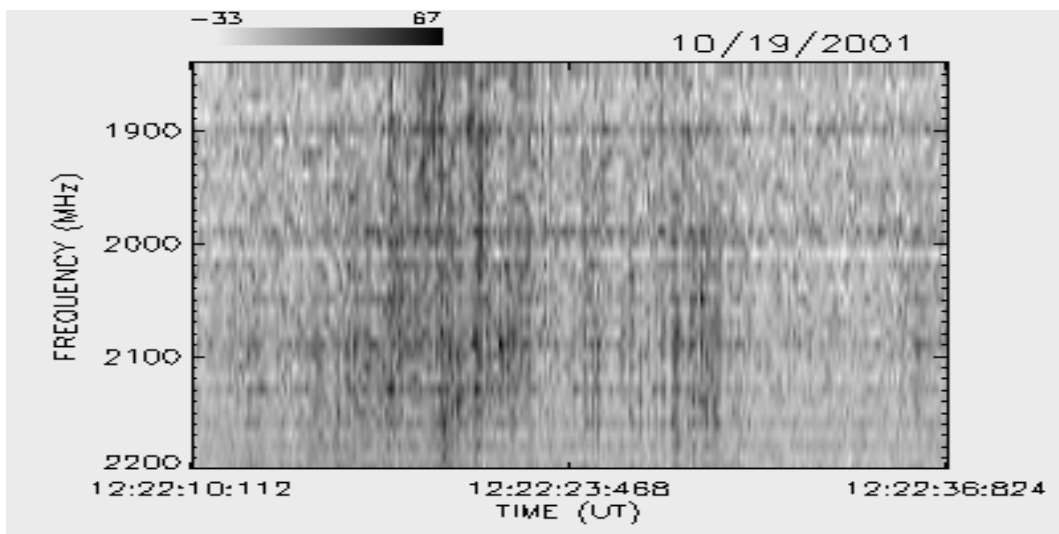
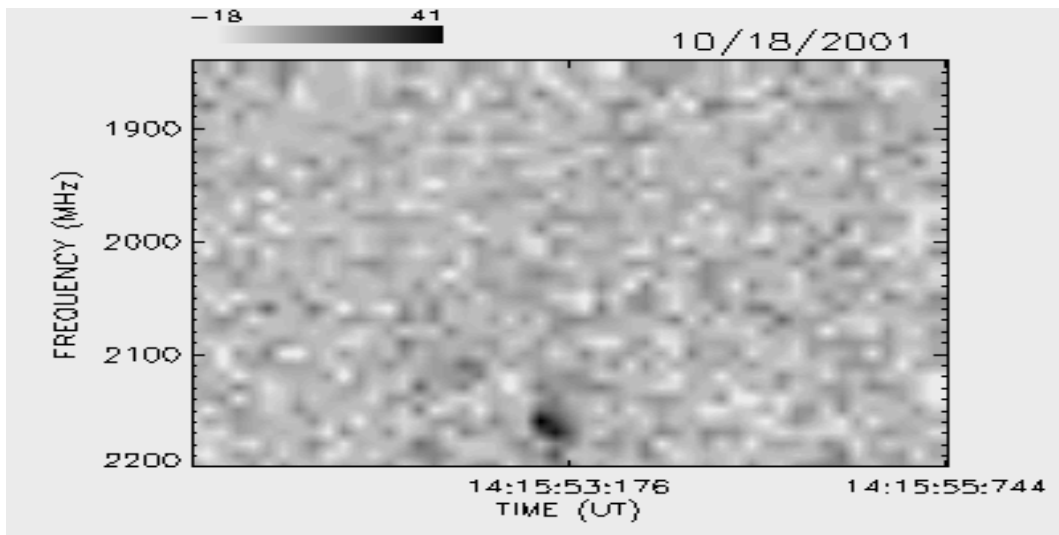
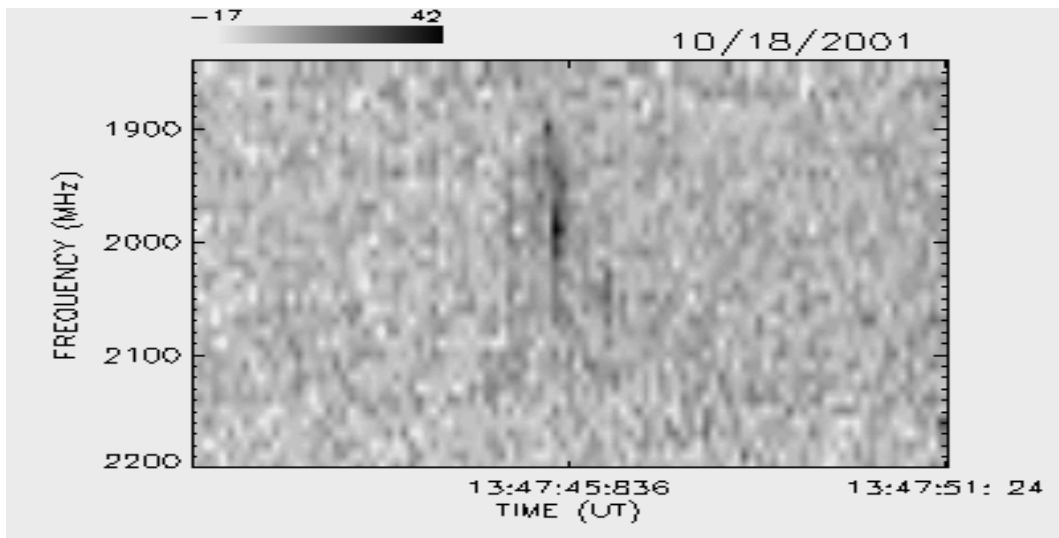
OUTUBRO / 2001



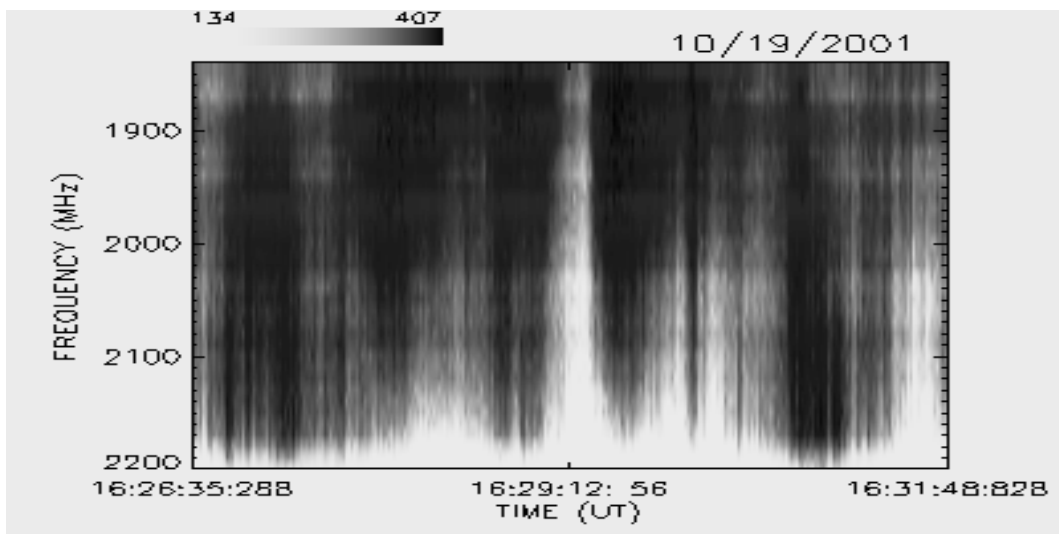
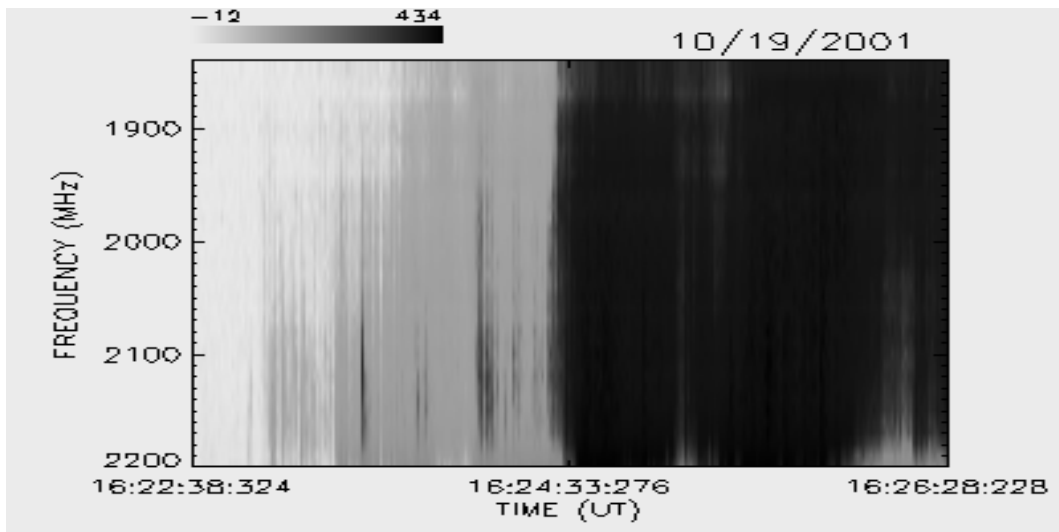
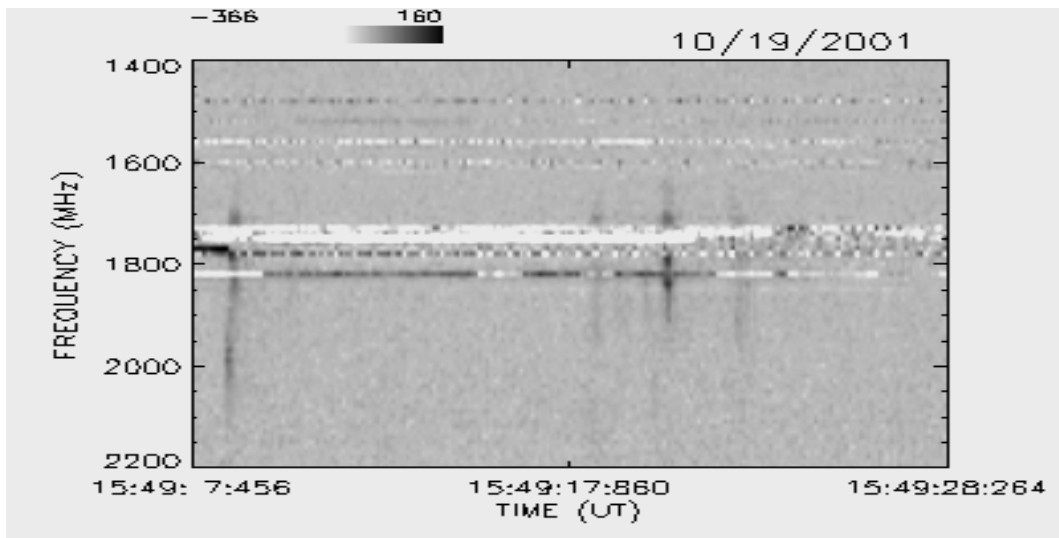
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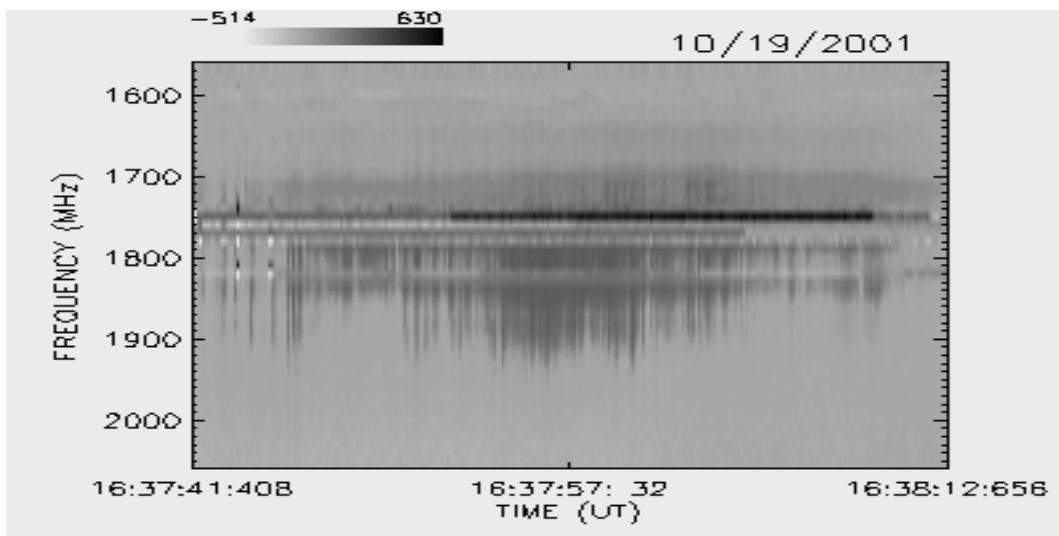
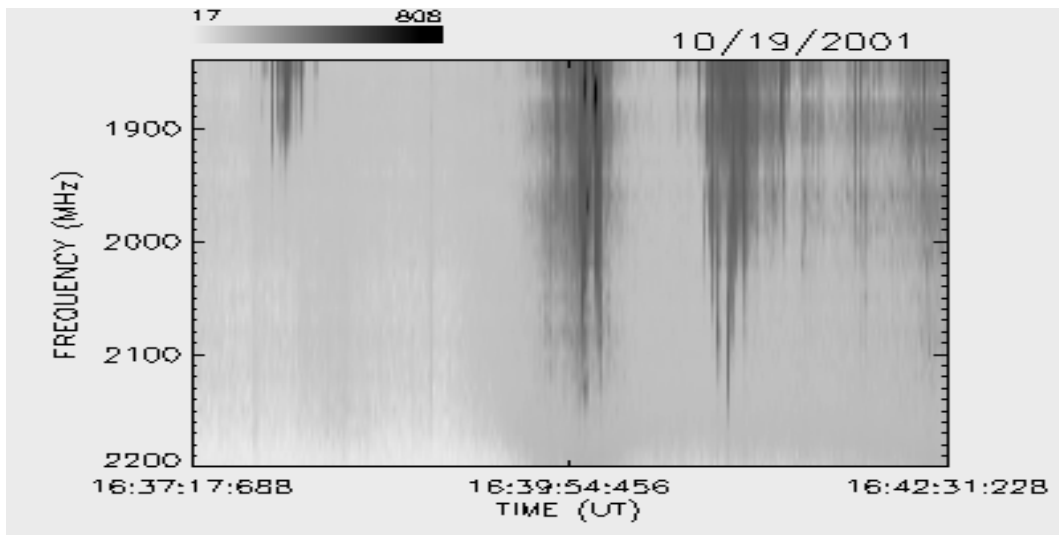
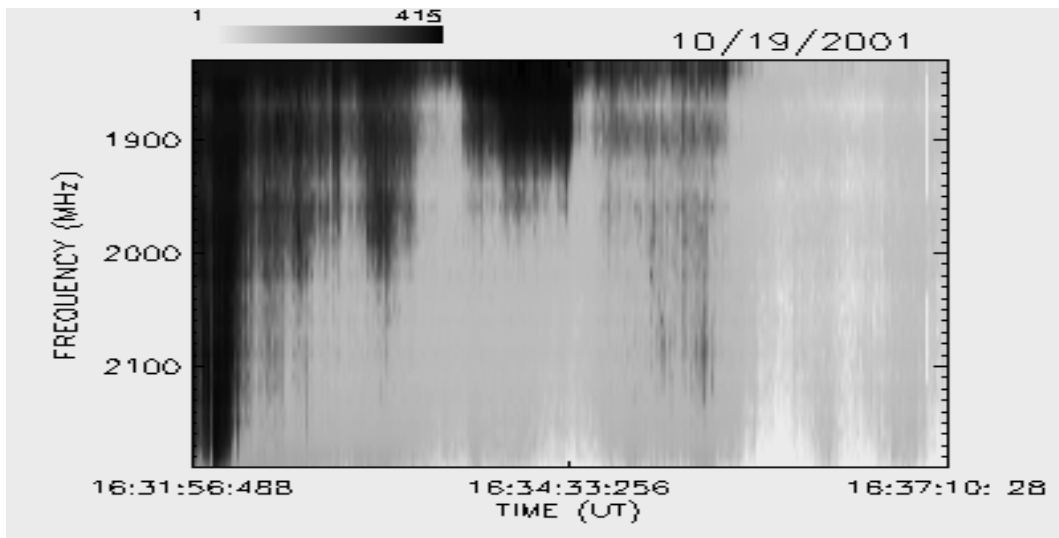
OUTUBRO / 2001



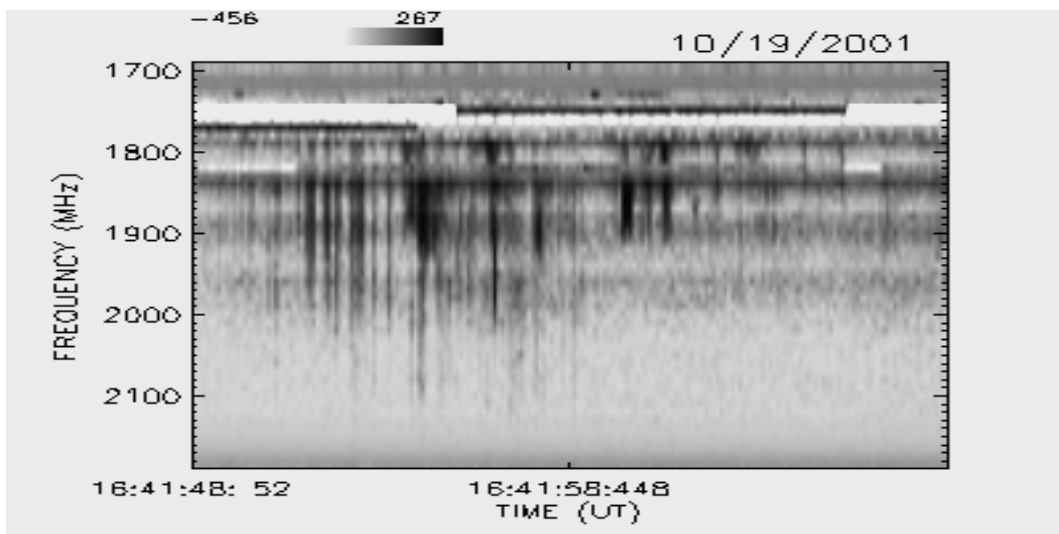
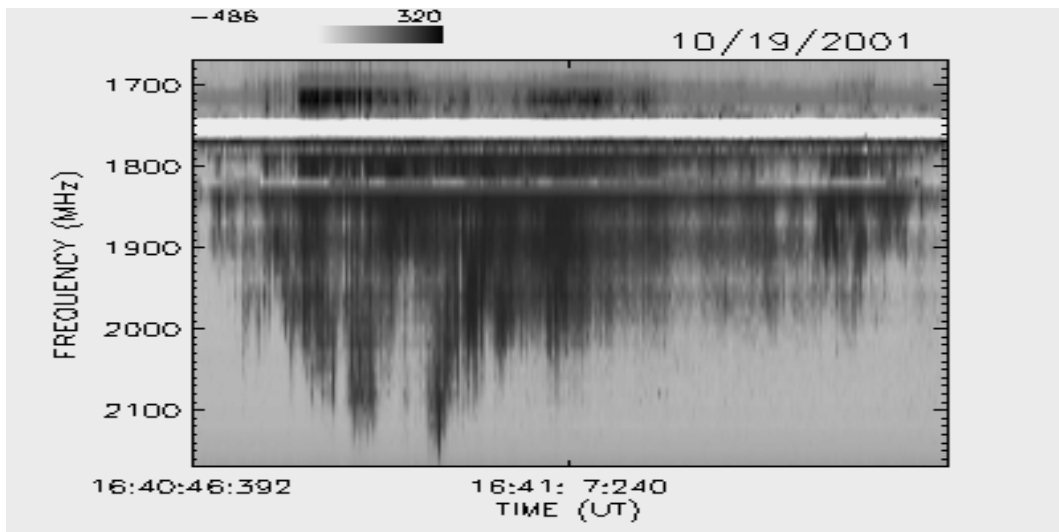
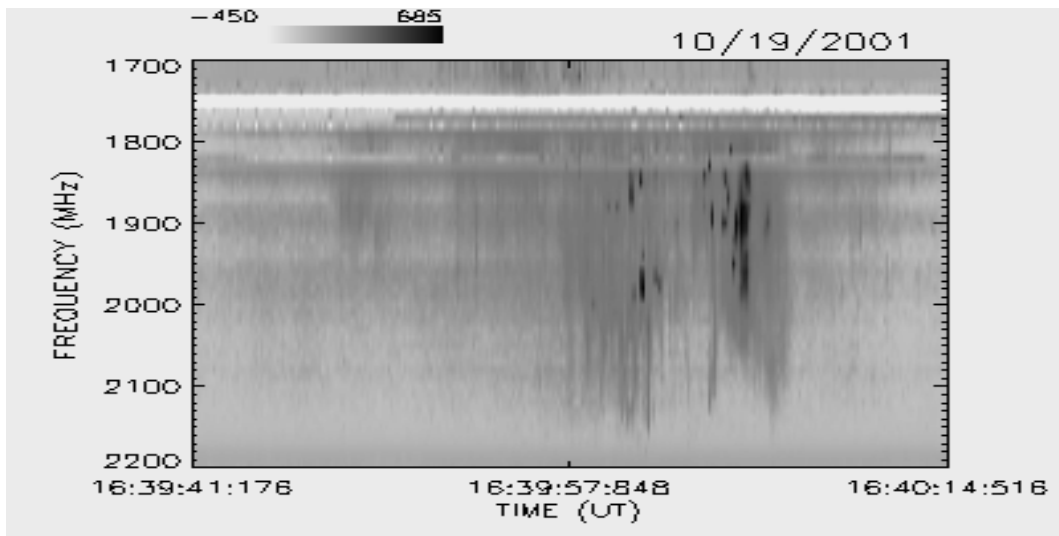
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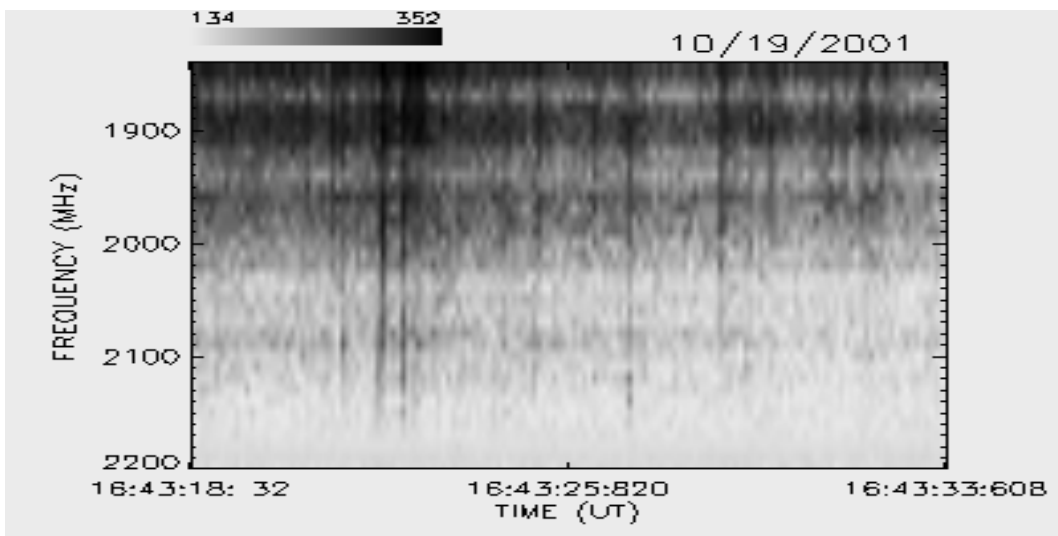
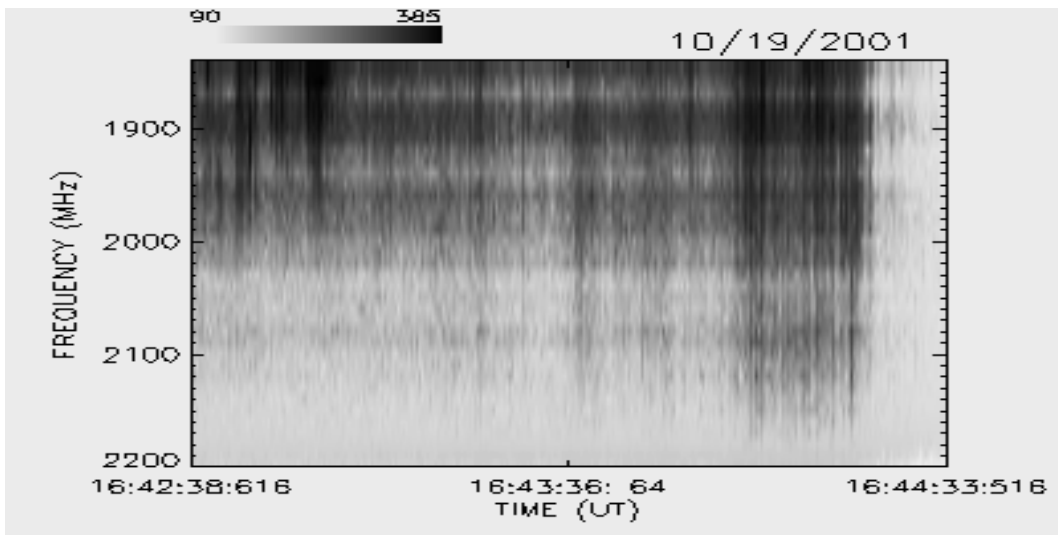
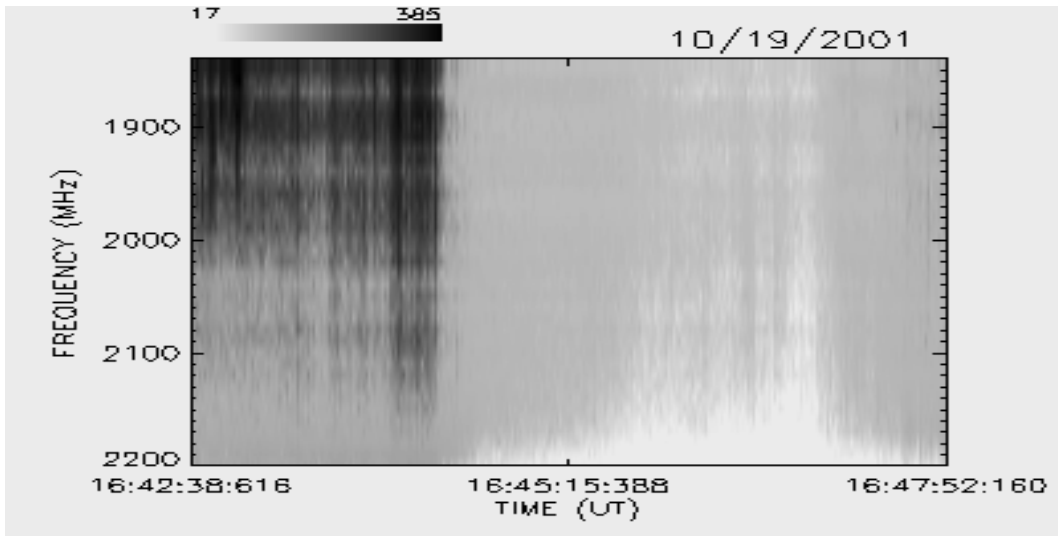
OUTUBRO / 2001



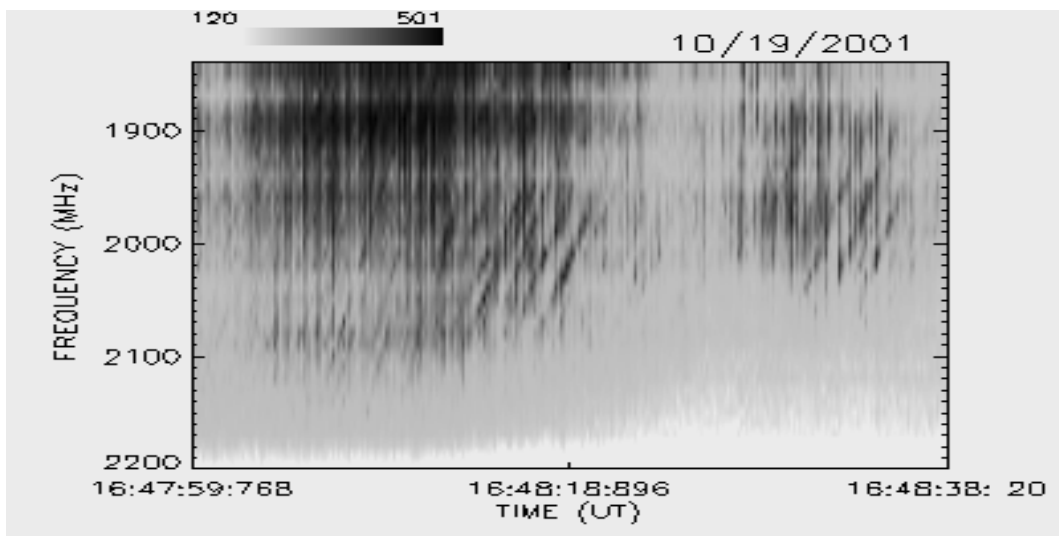
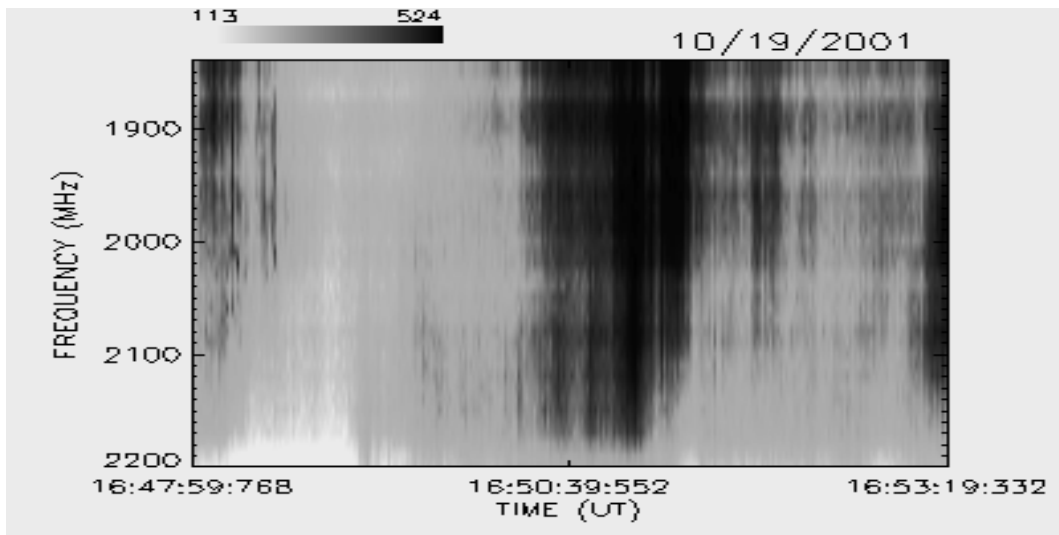
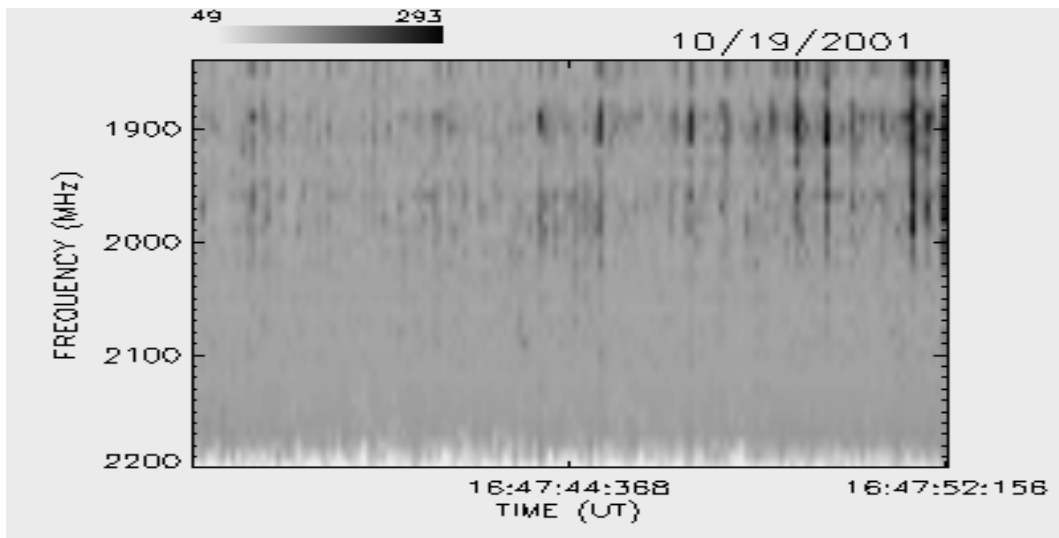
OUTUBRO / 2001



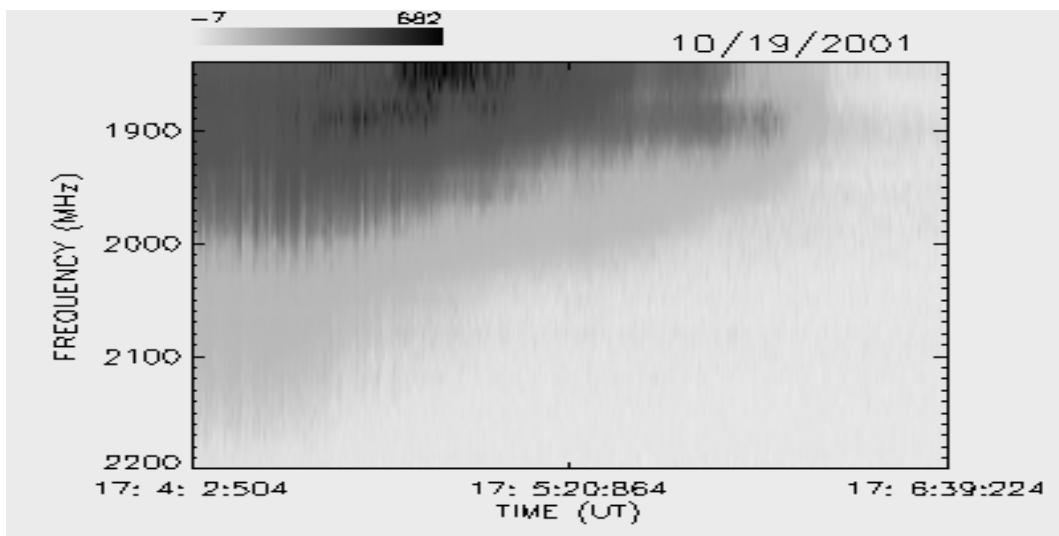
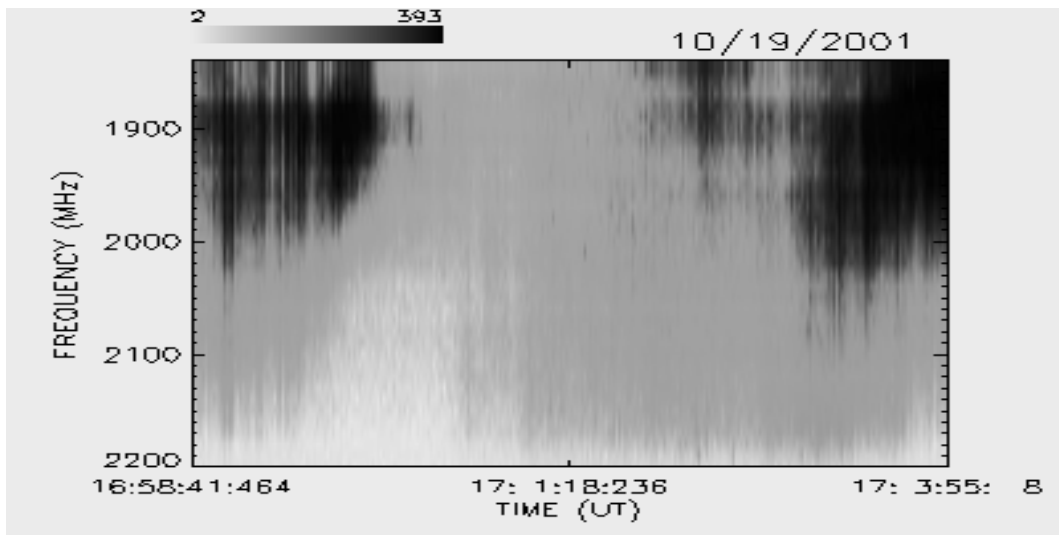
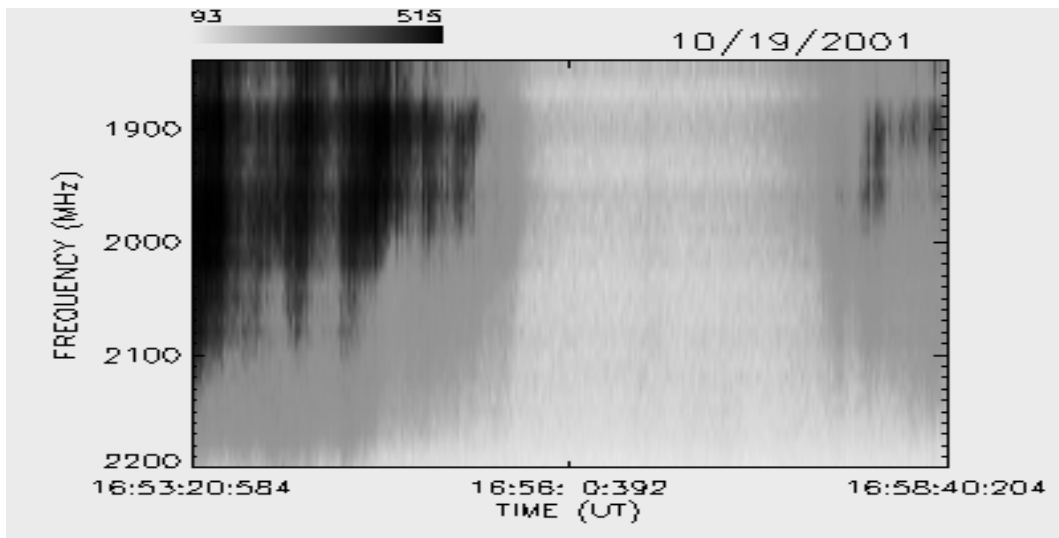
OUTUBRO / 2001



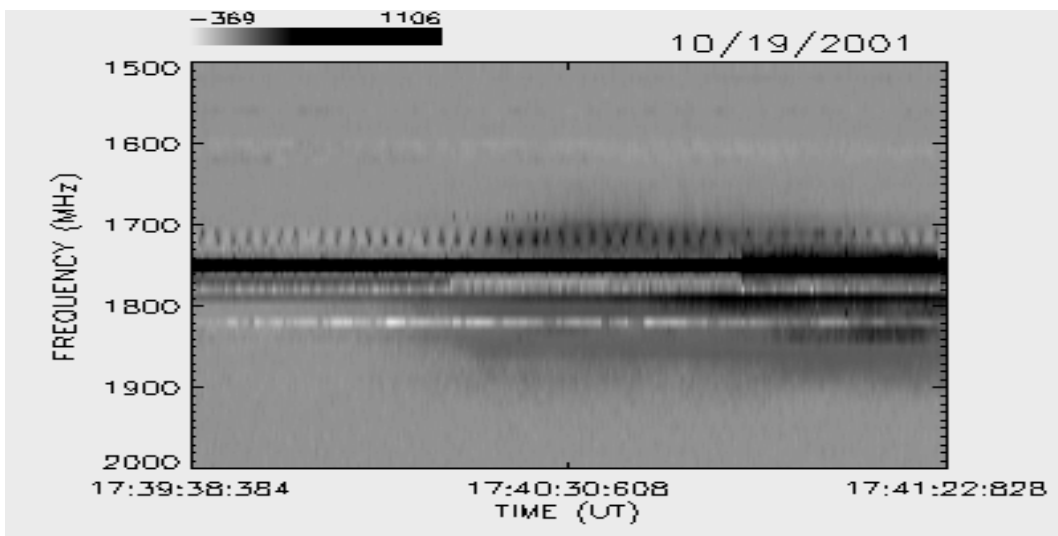
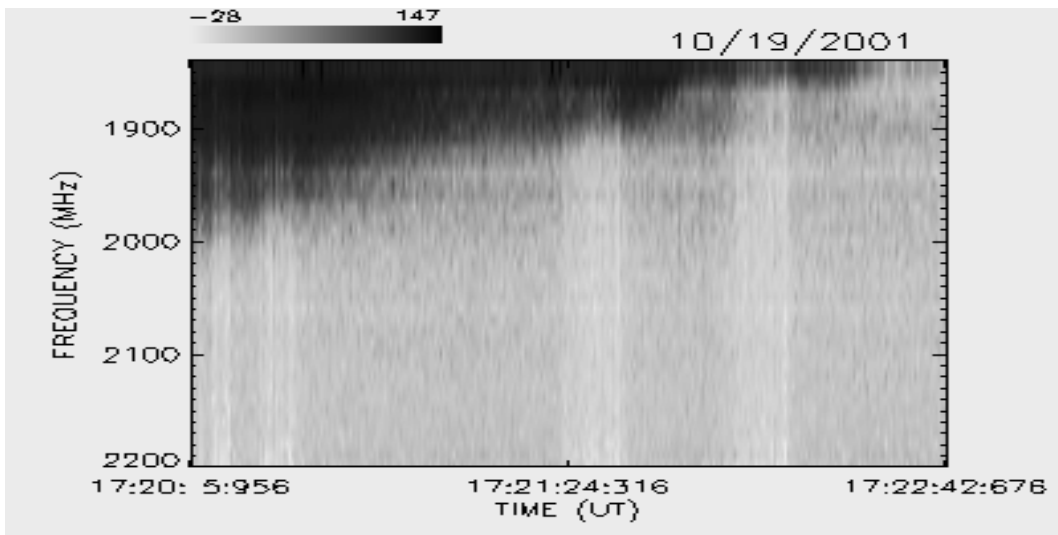
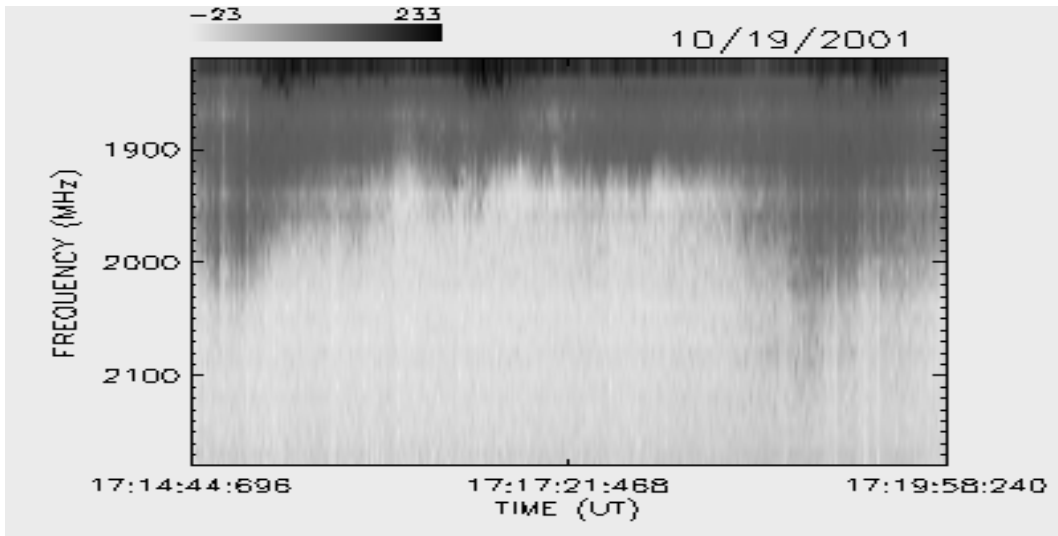
OUTUBRO / 2001



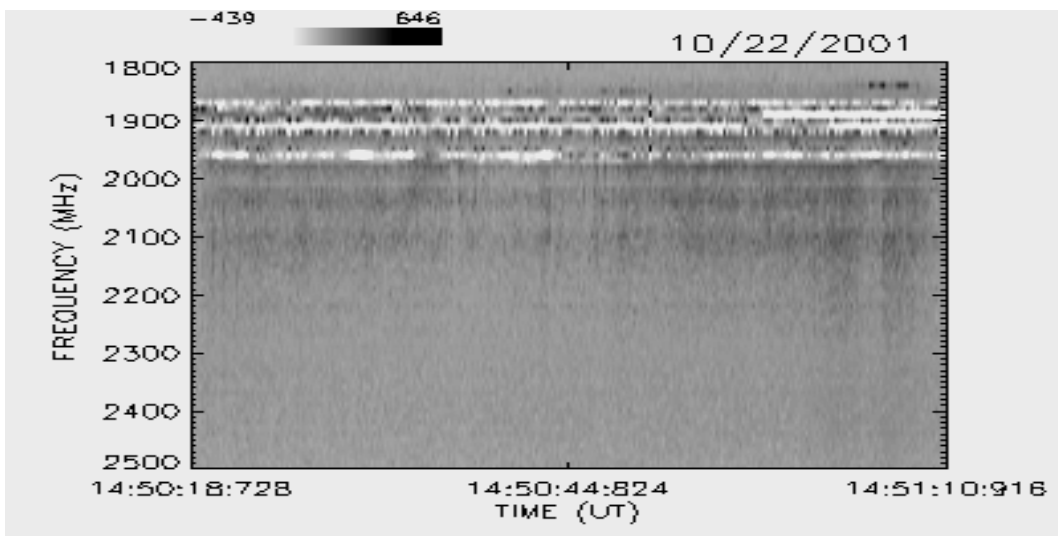
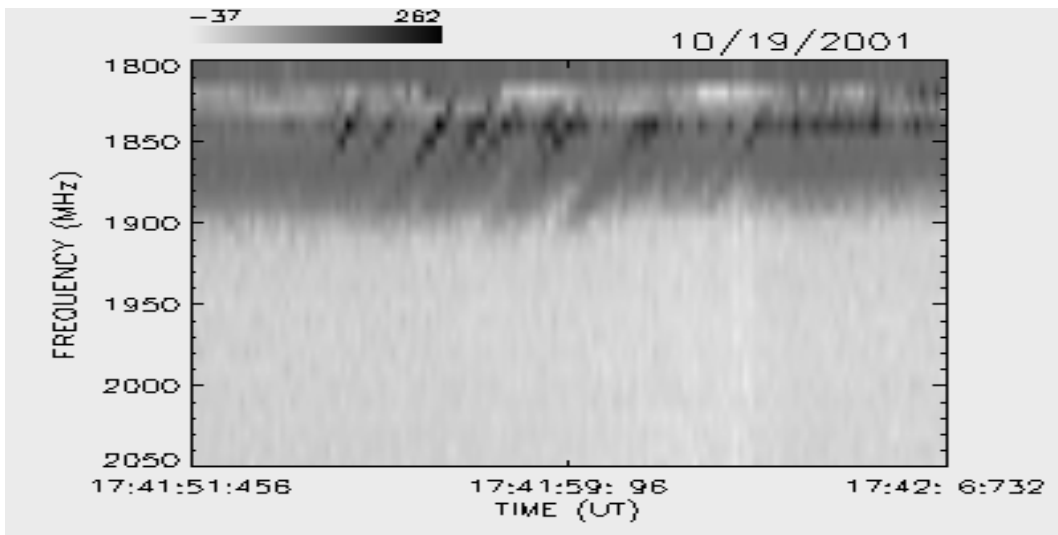
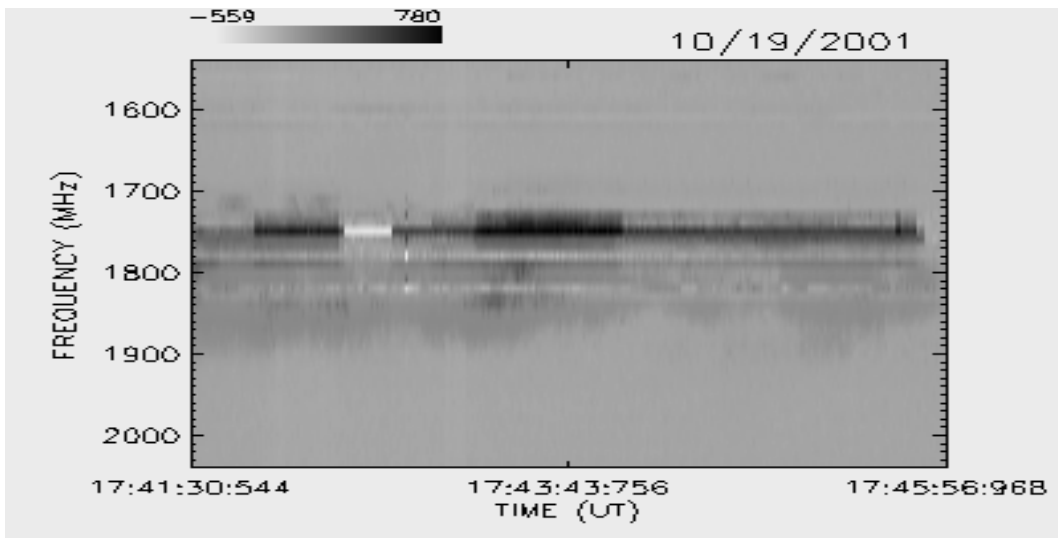
OUTUBRO / 2001



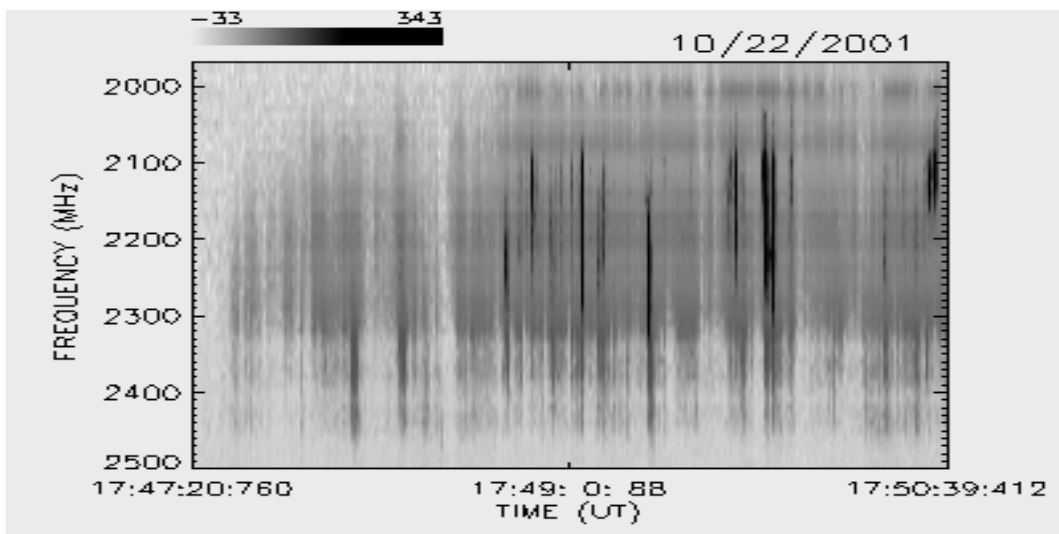
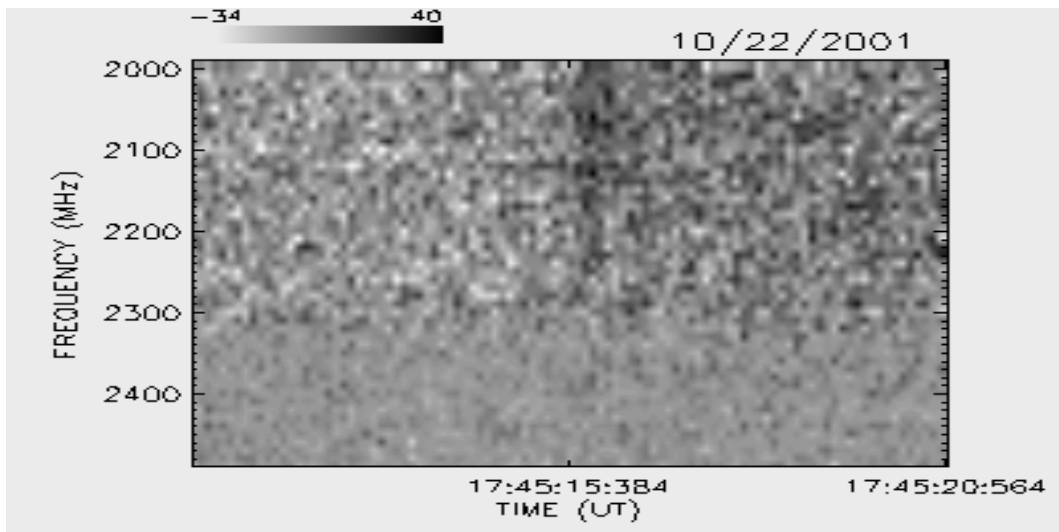
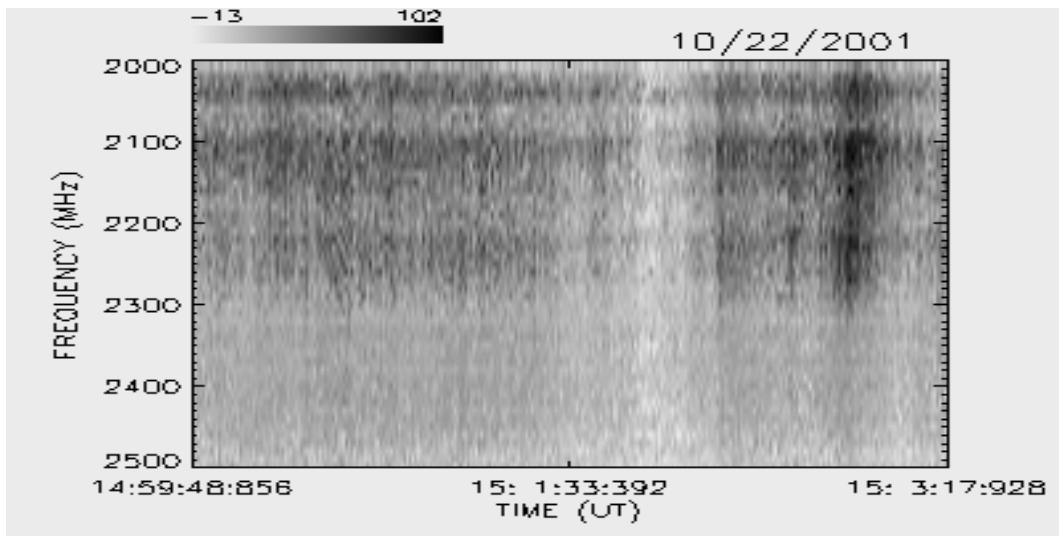
OUTUBRO / 2001



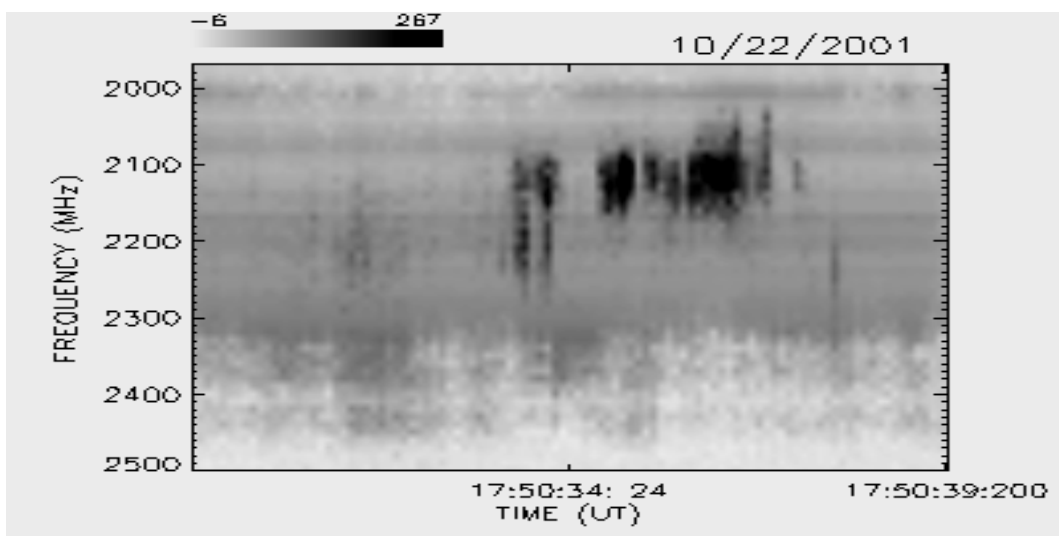
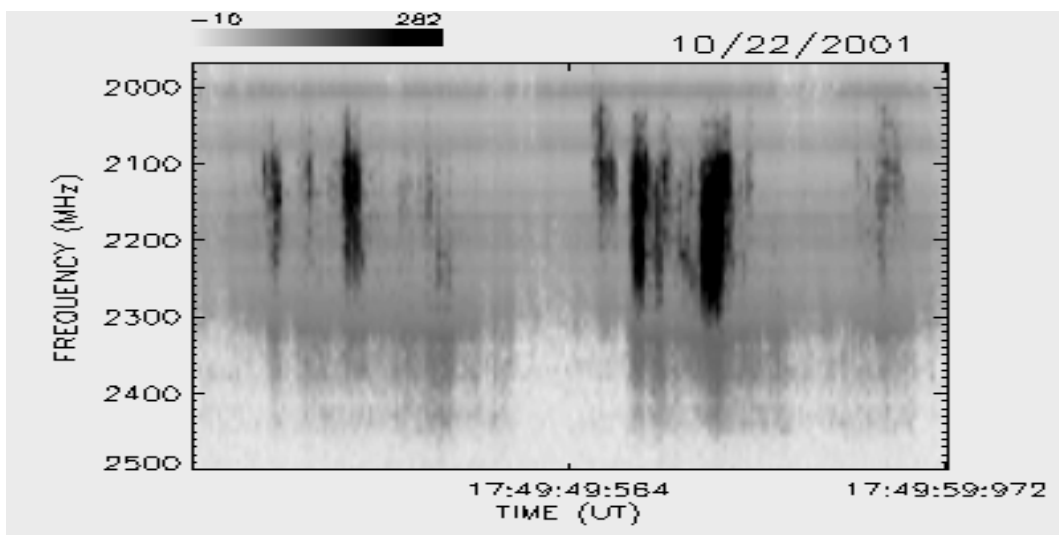
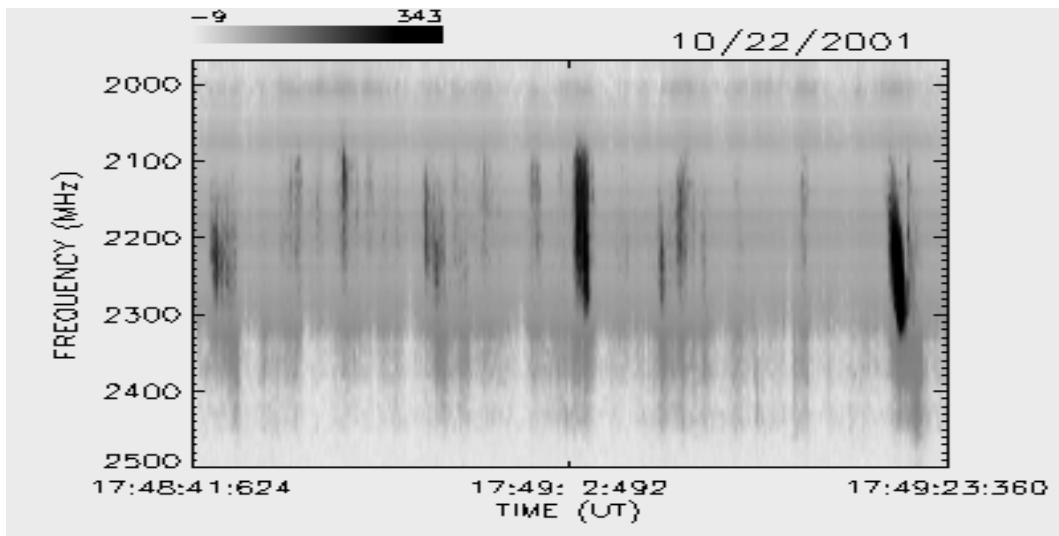
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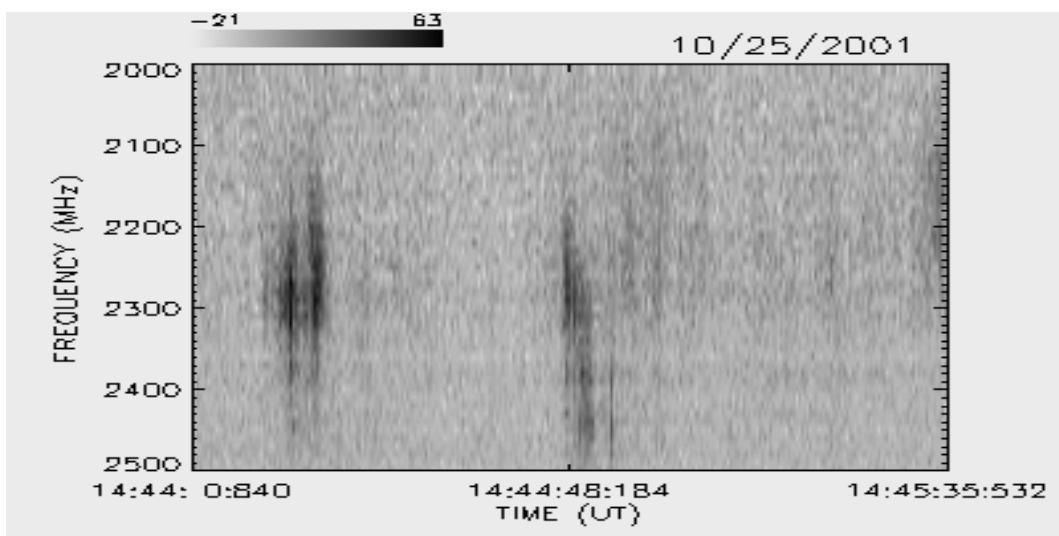
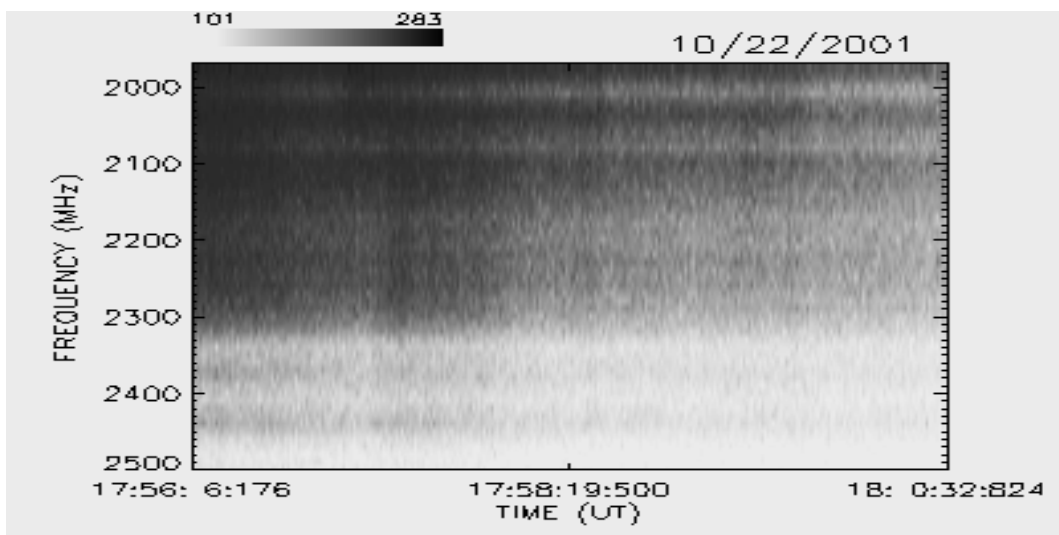
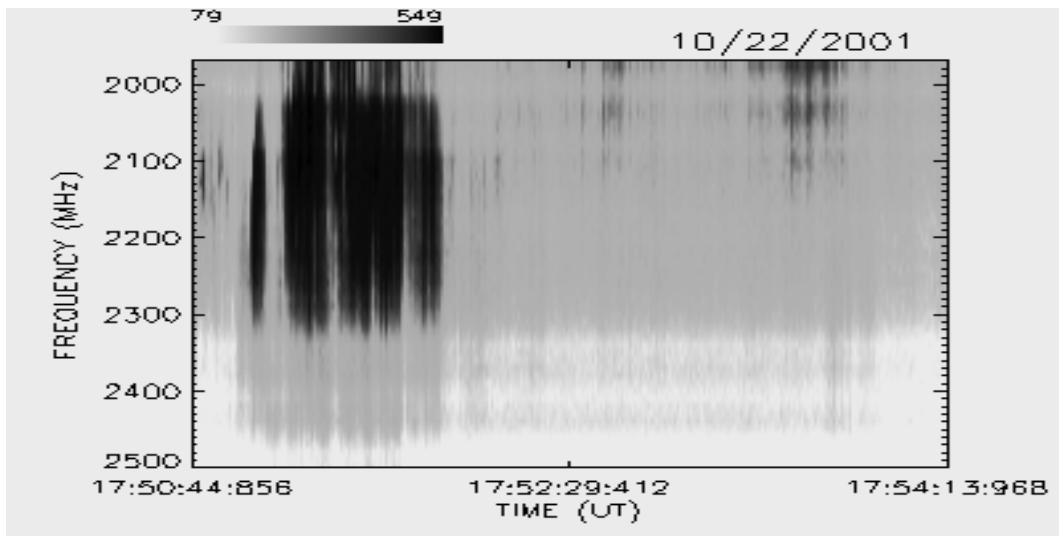
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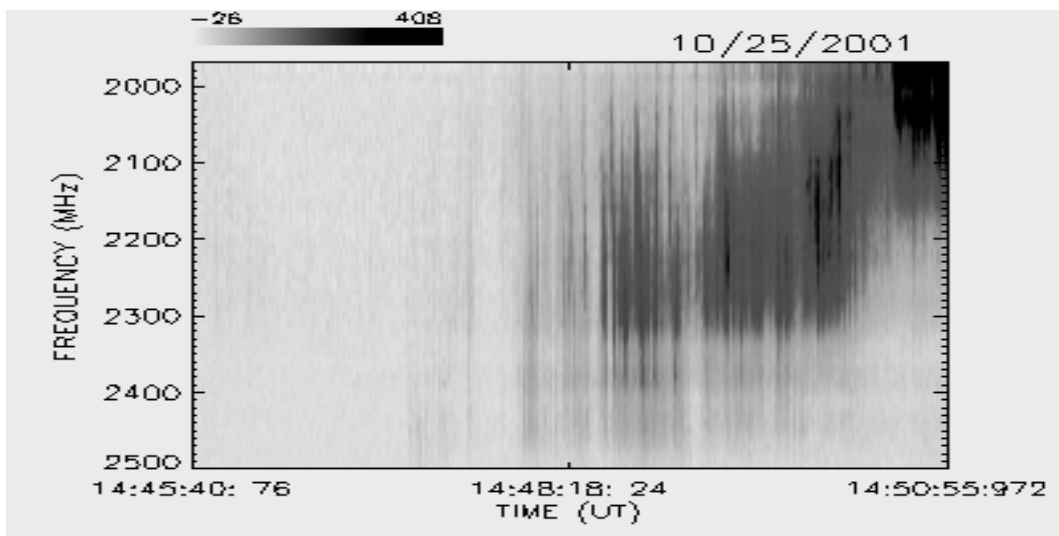
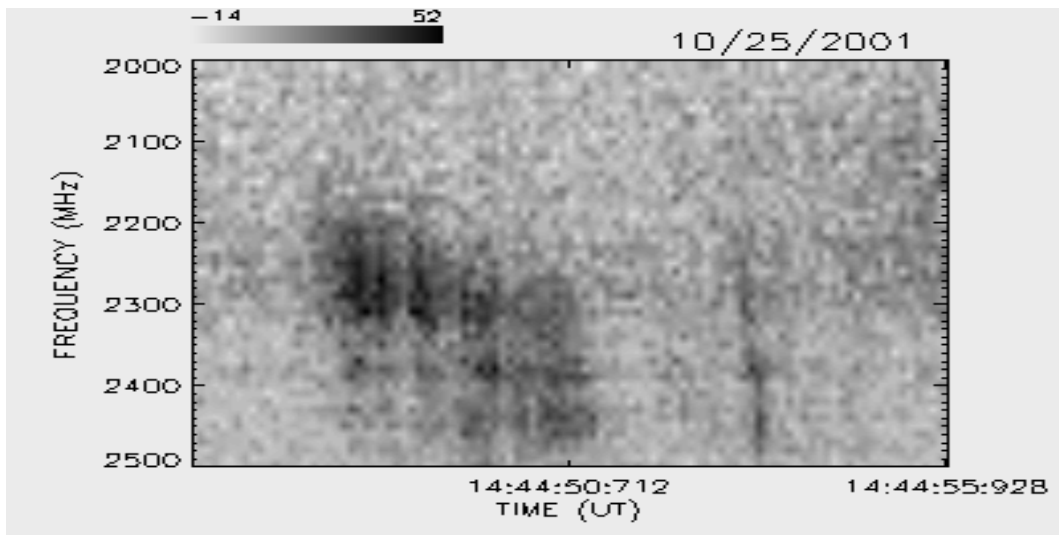
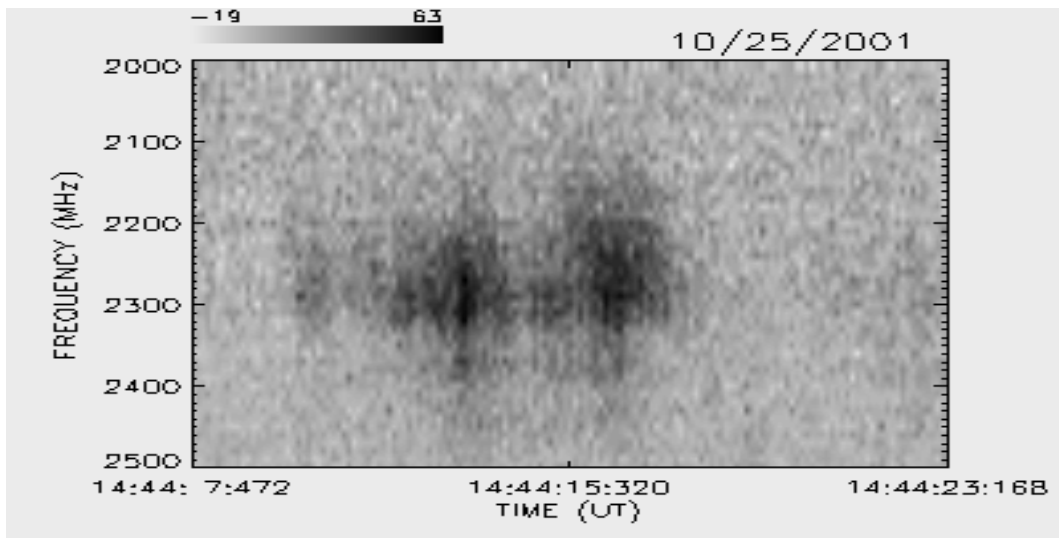
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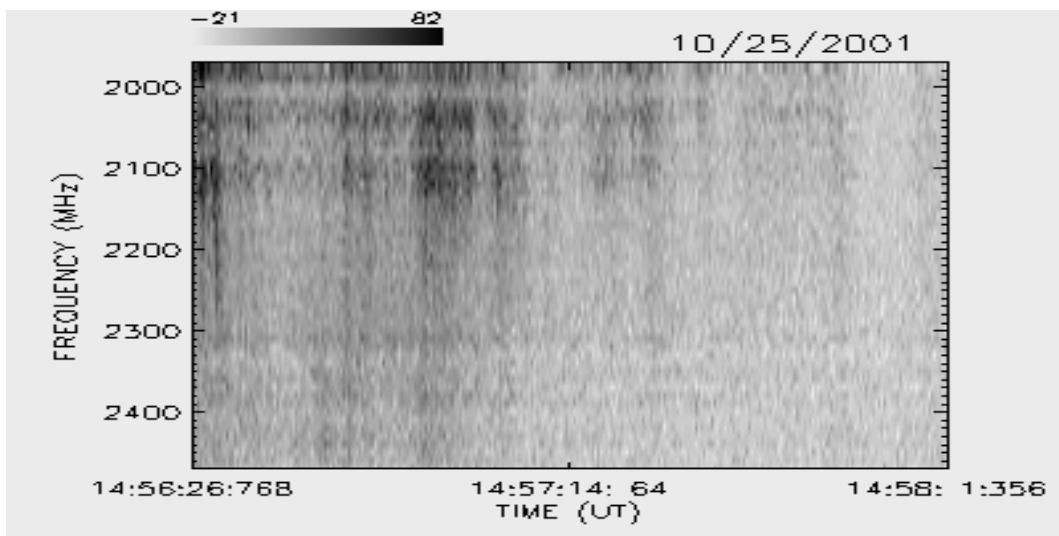
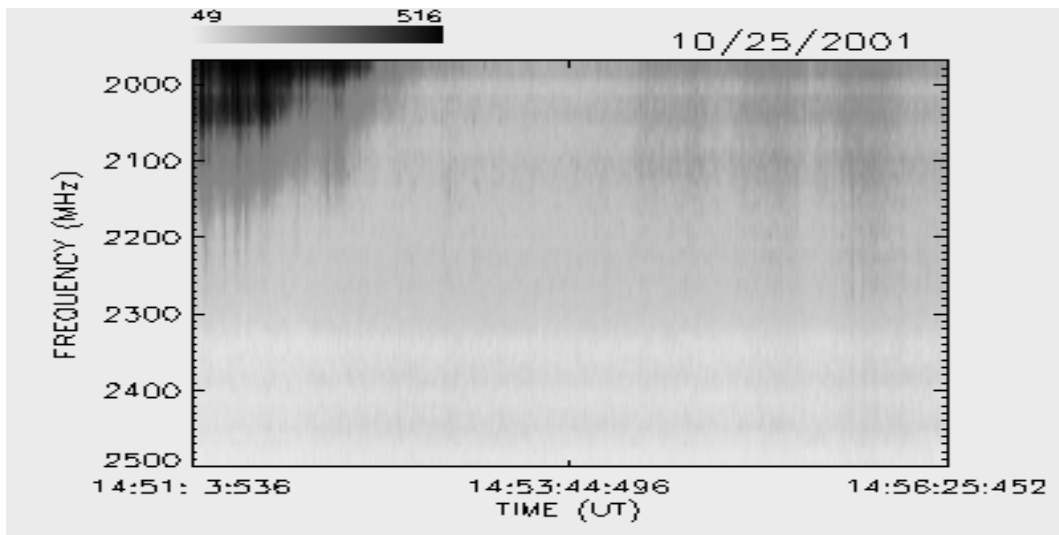
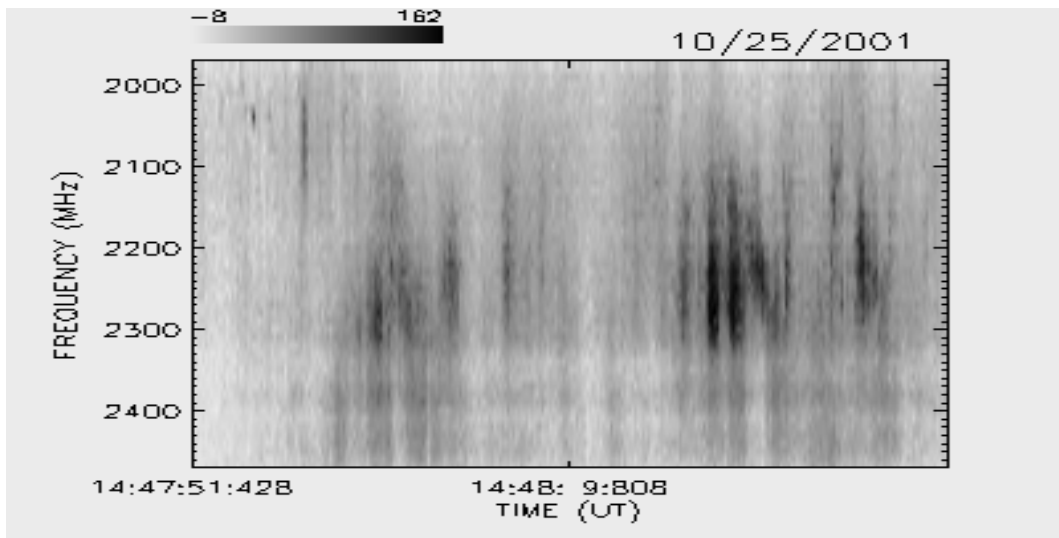
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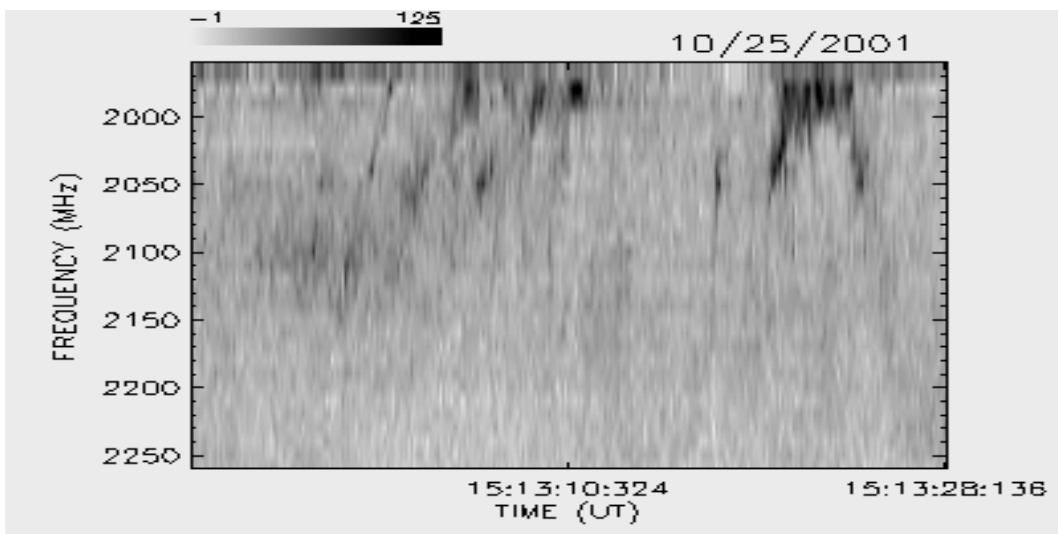
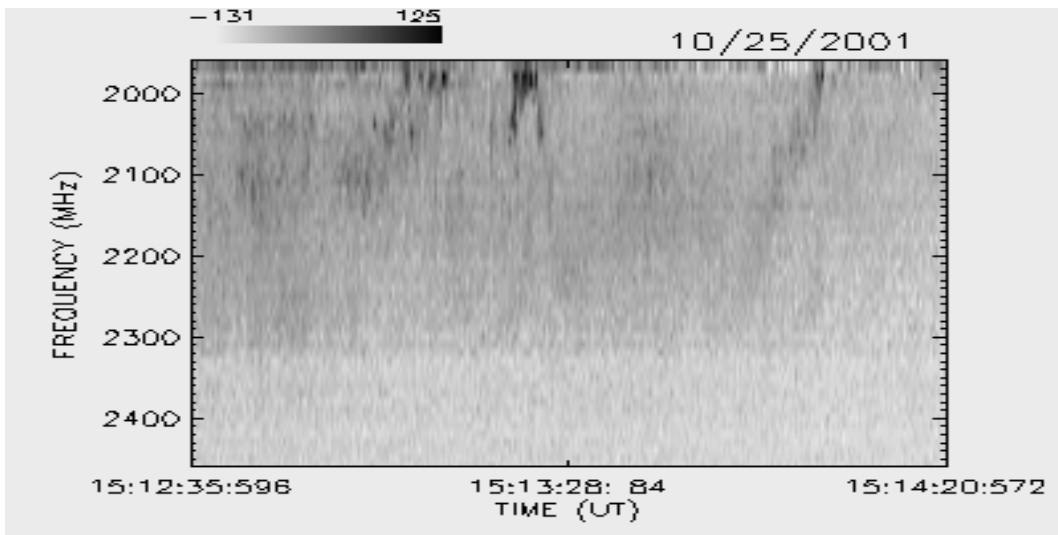
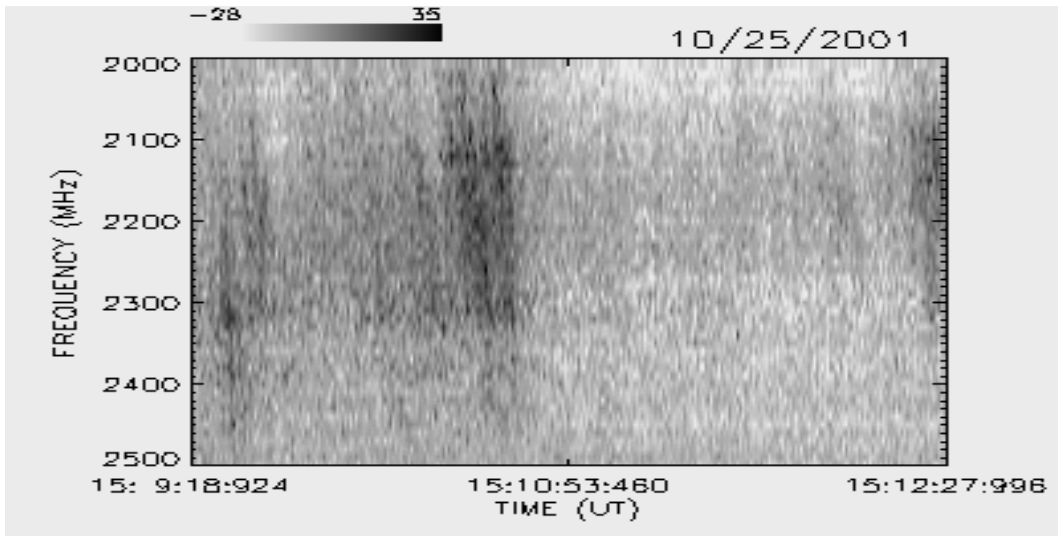
OUTUBRO / 2001



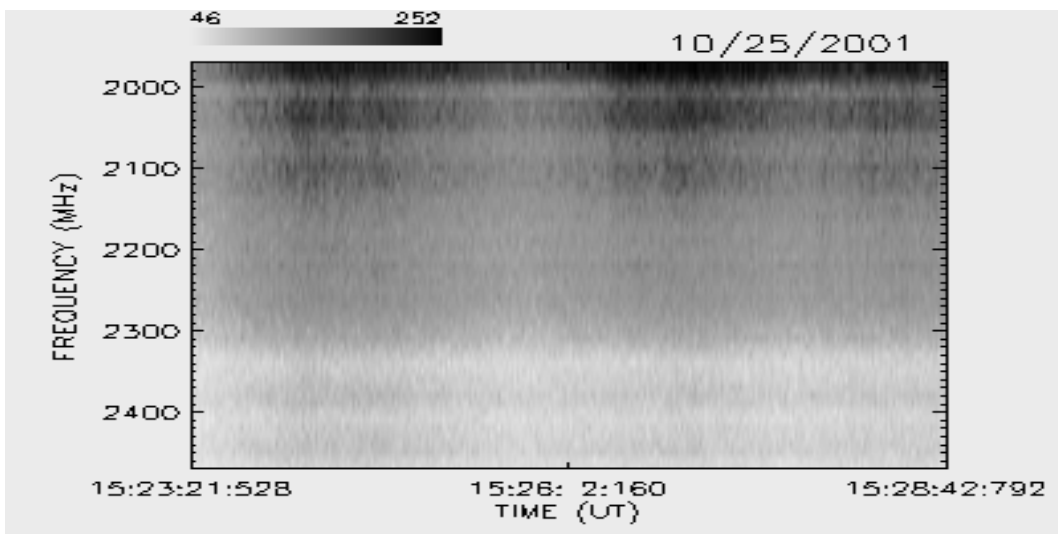
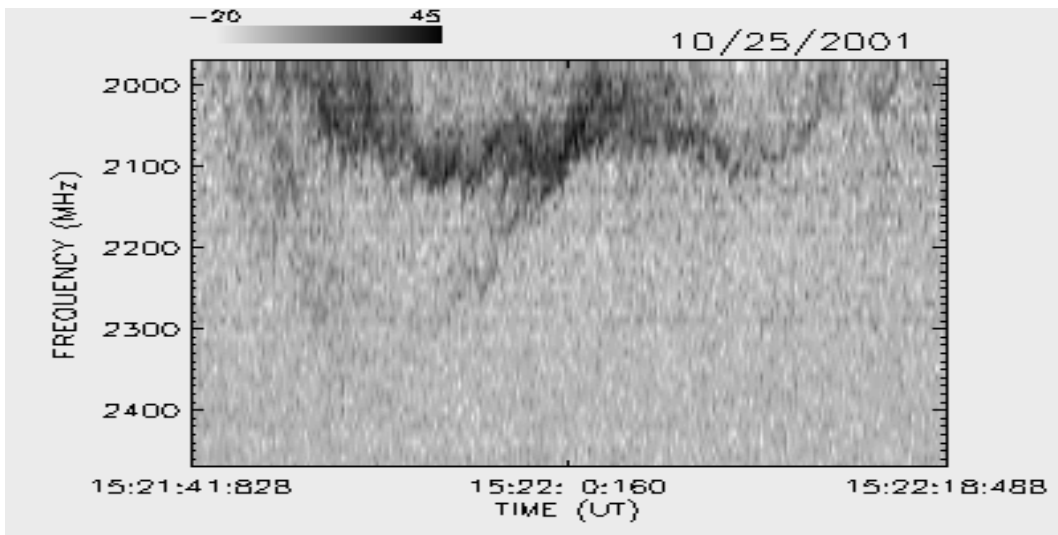
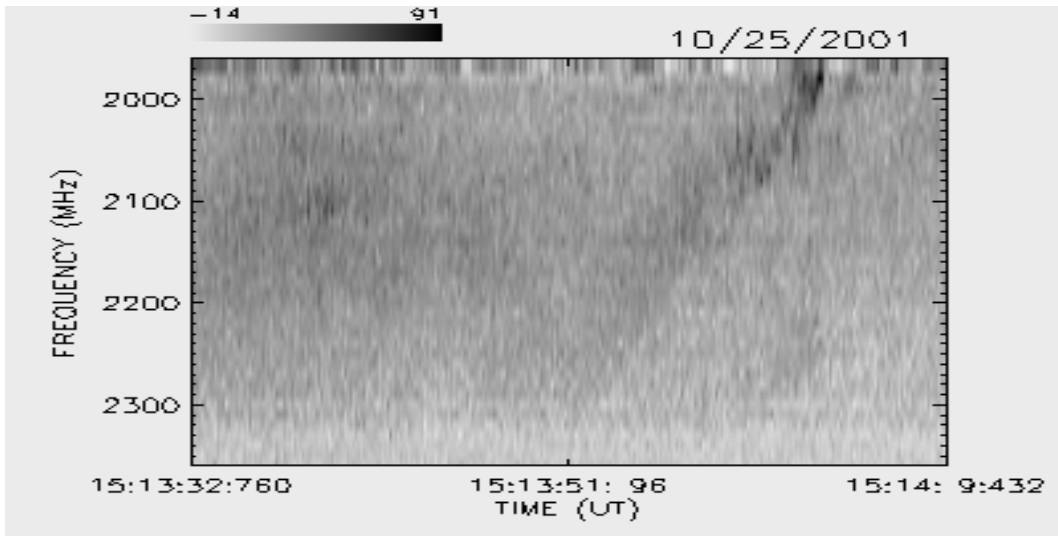
OUTUBRO / 2001



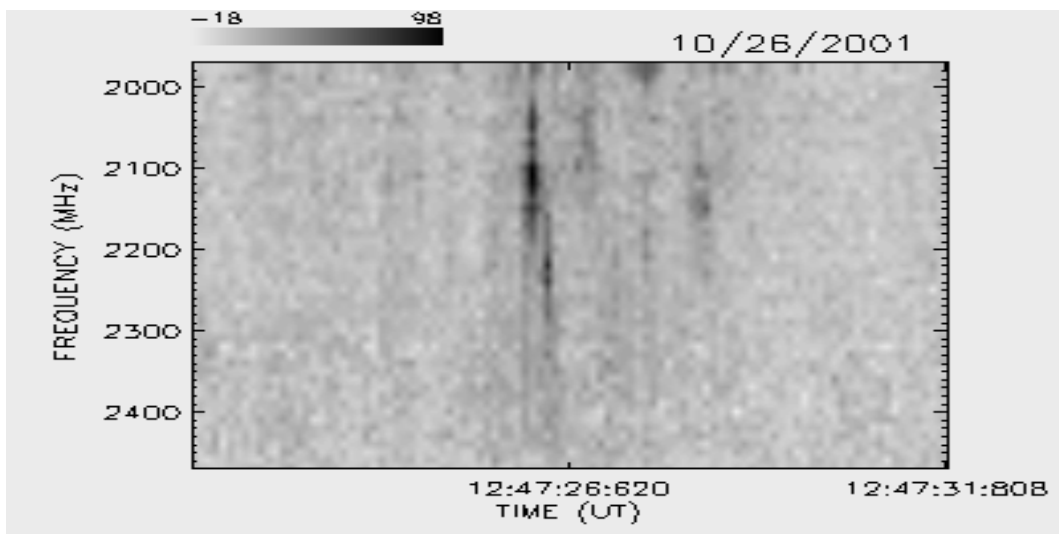
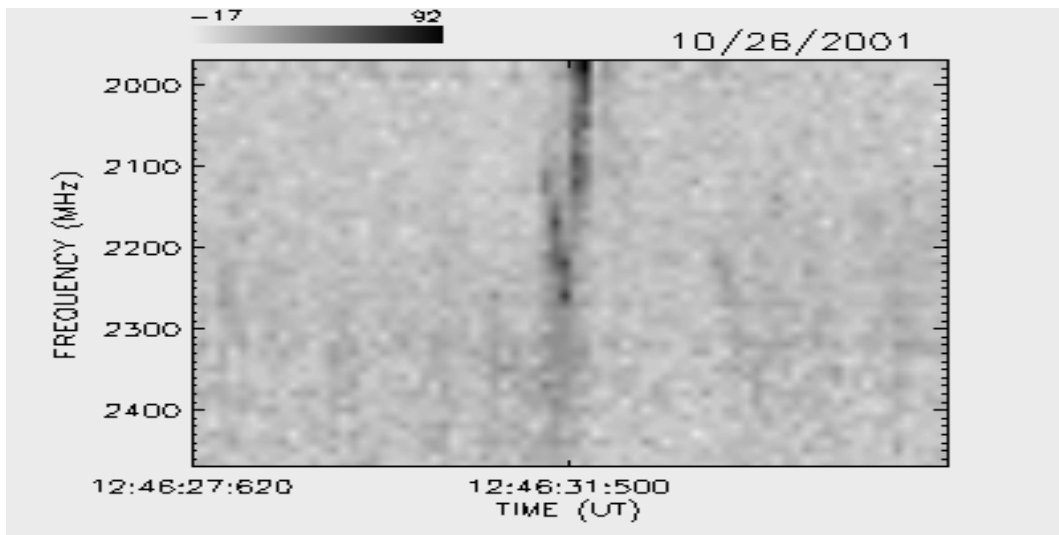
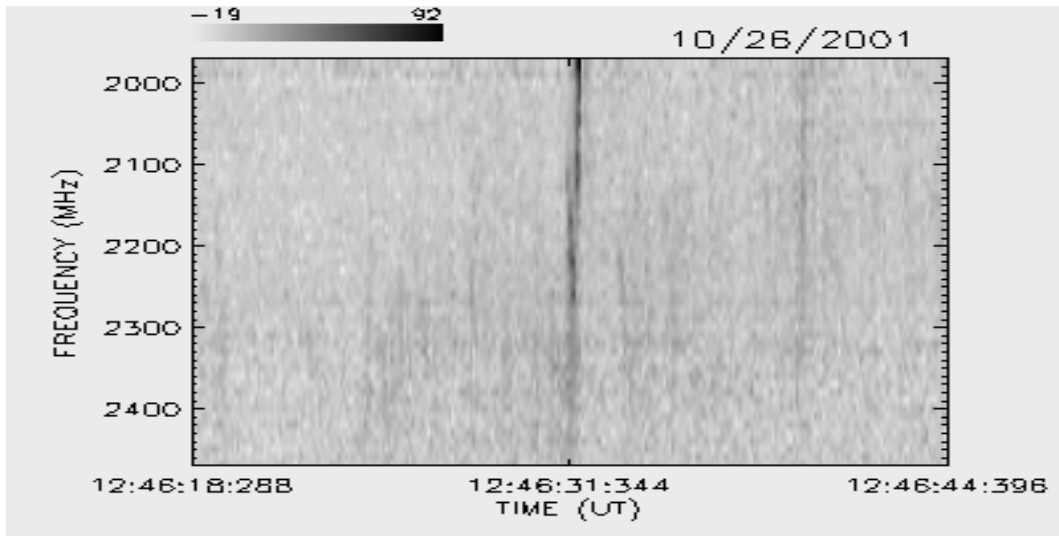
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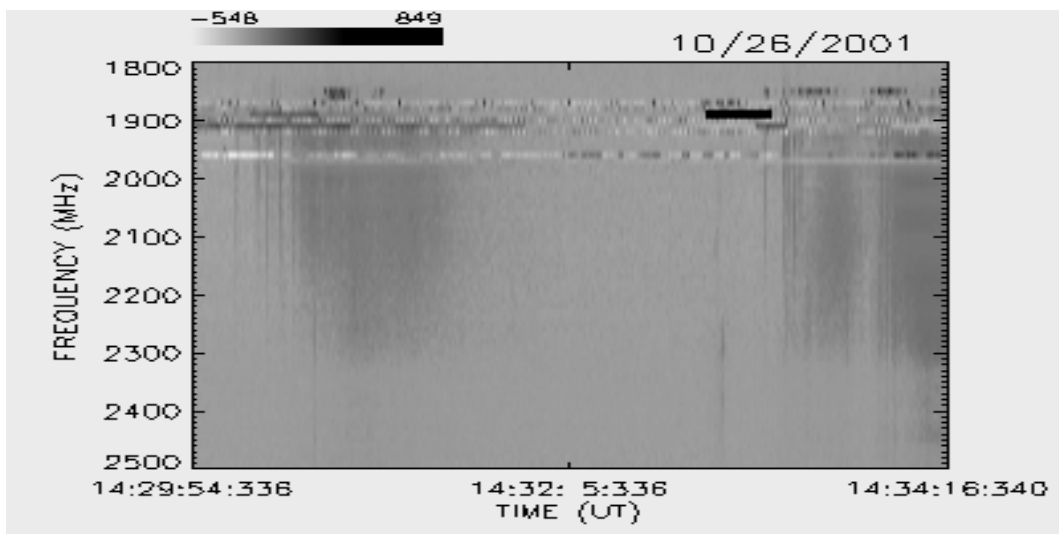
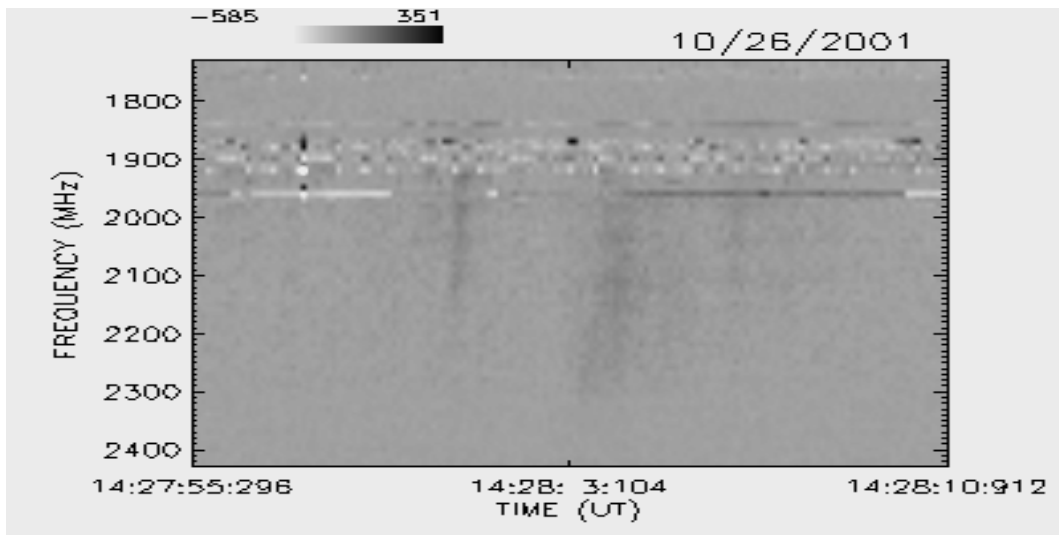
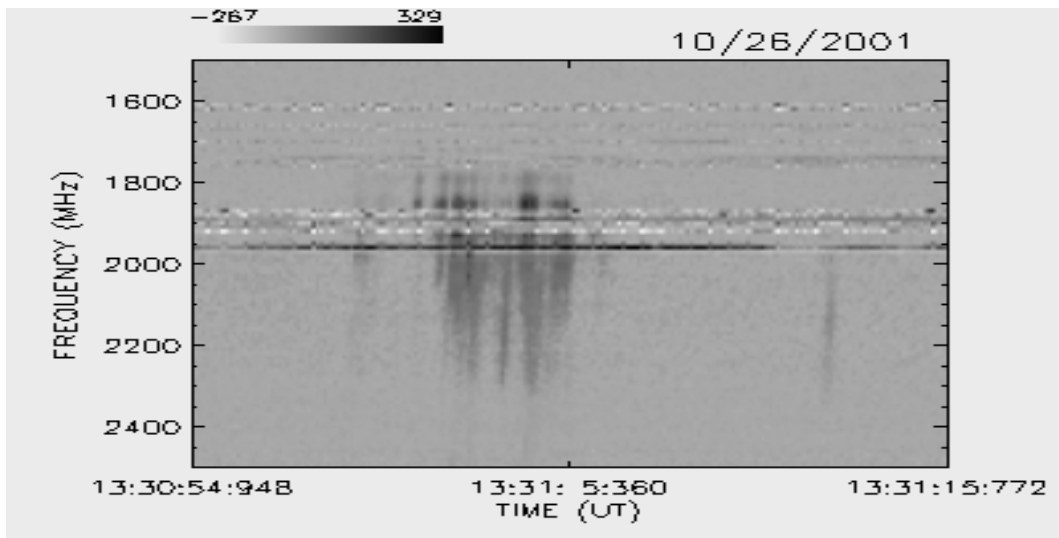
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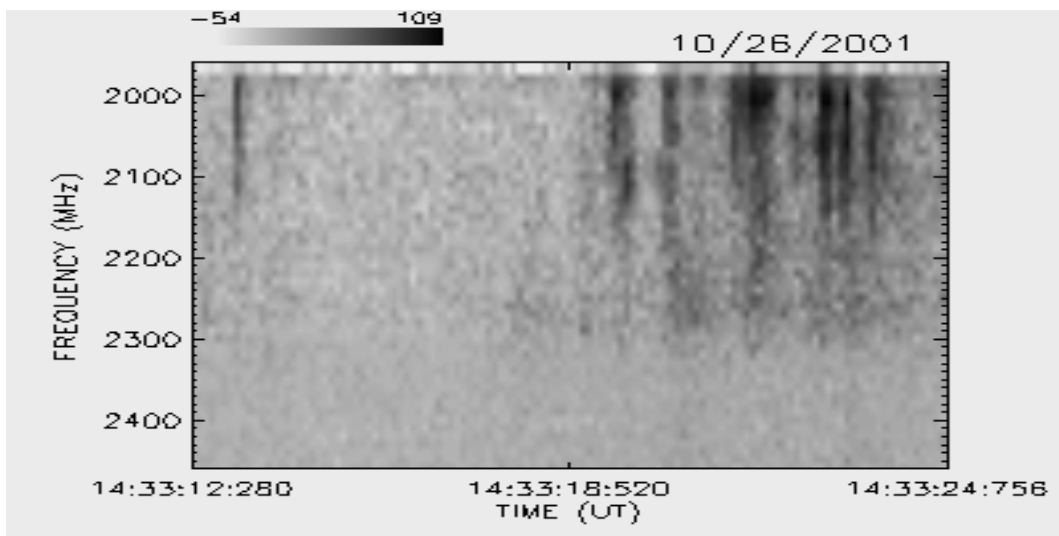
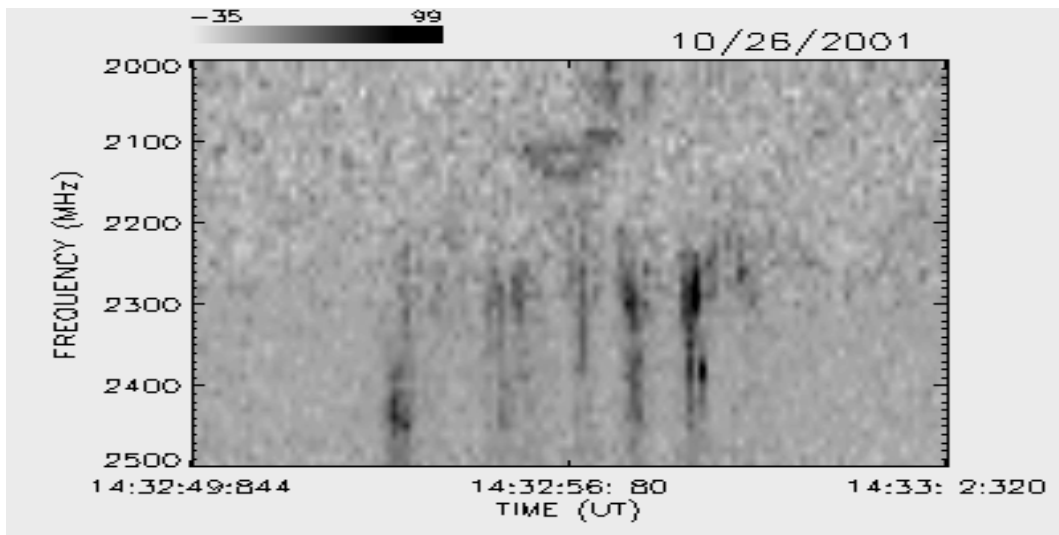
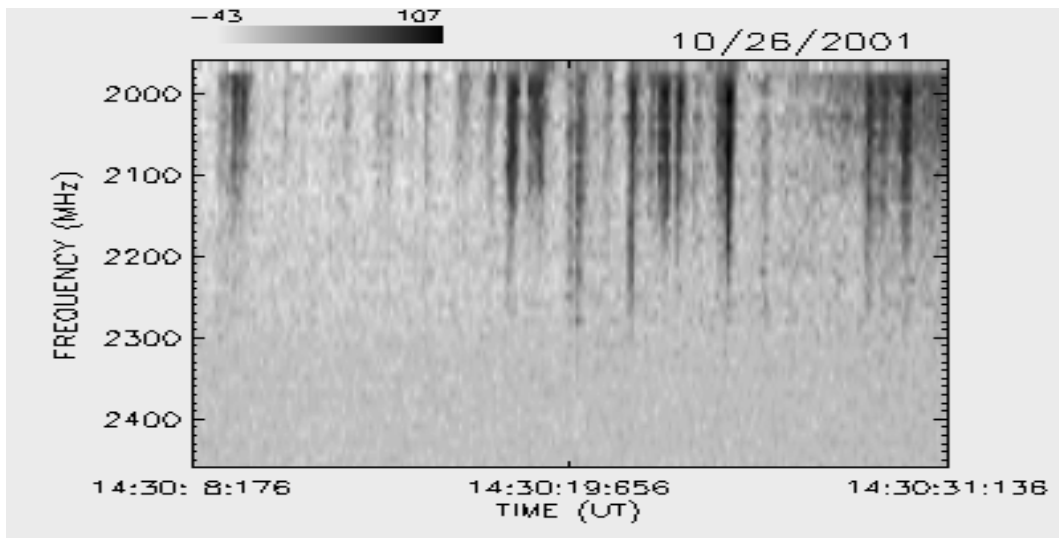
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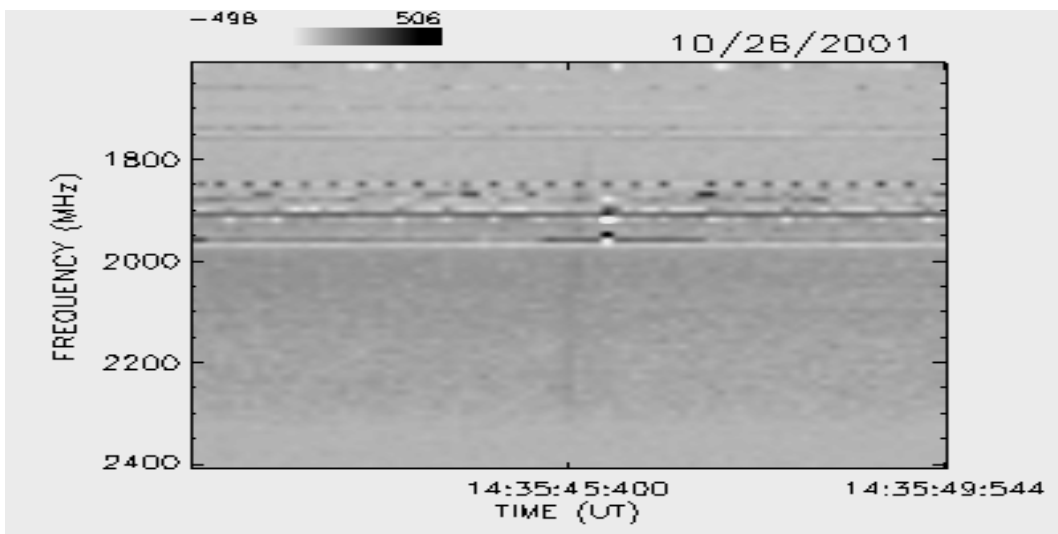
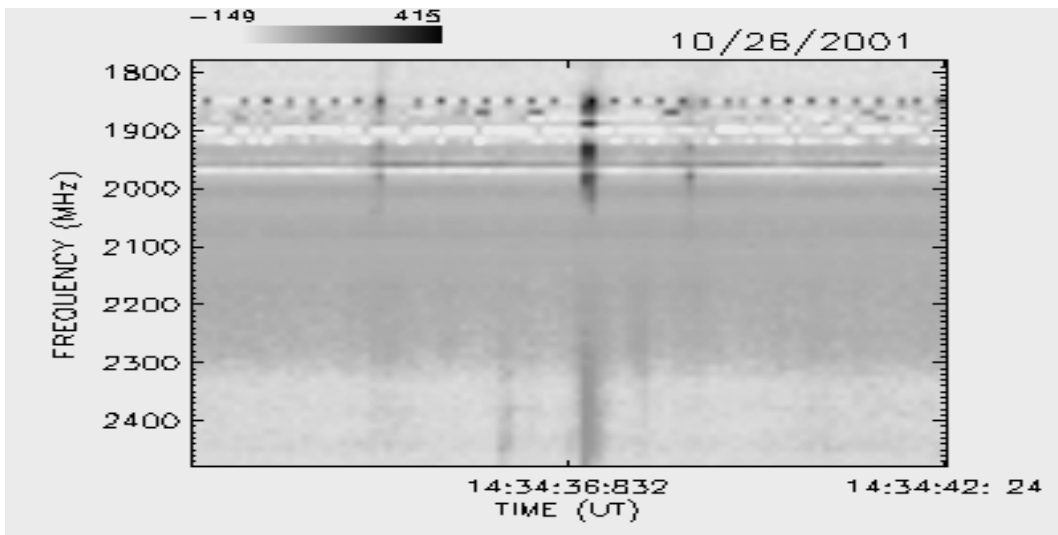
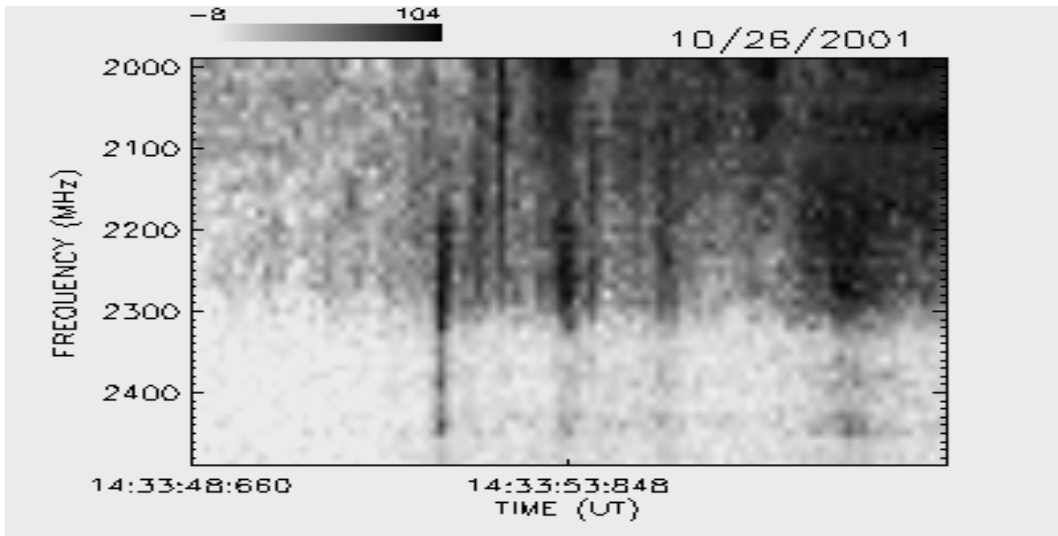
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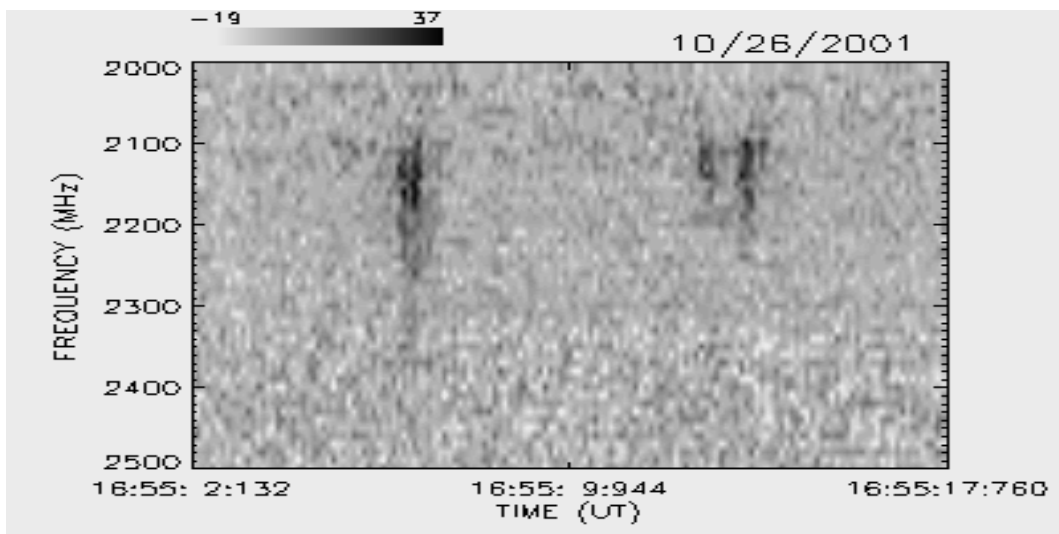
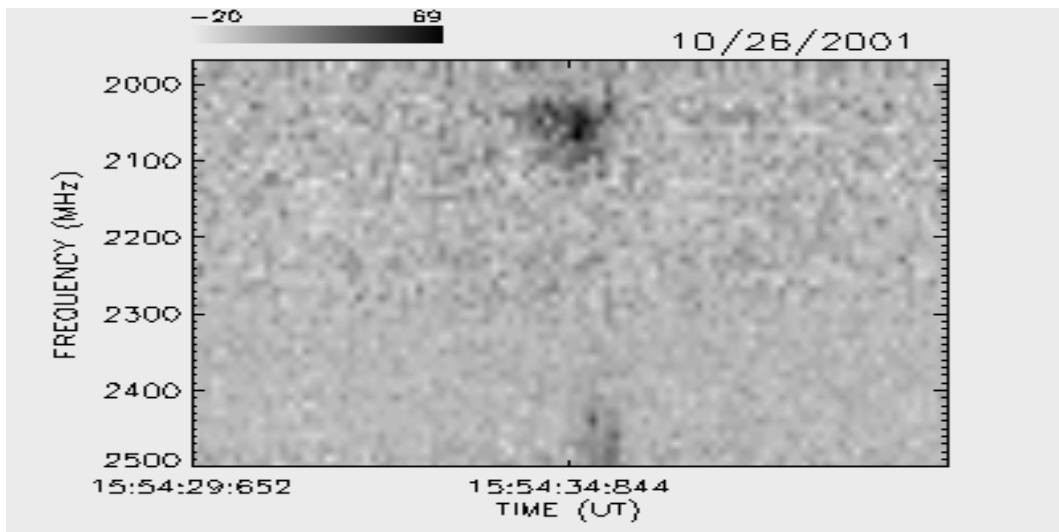
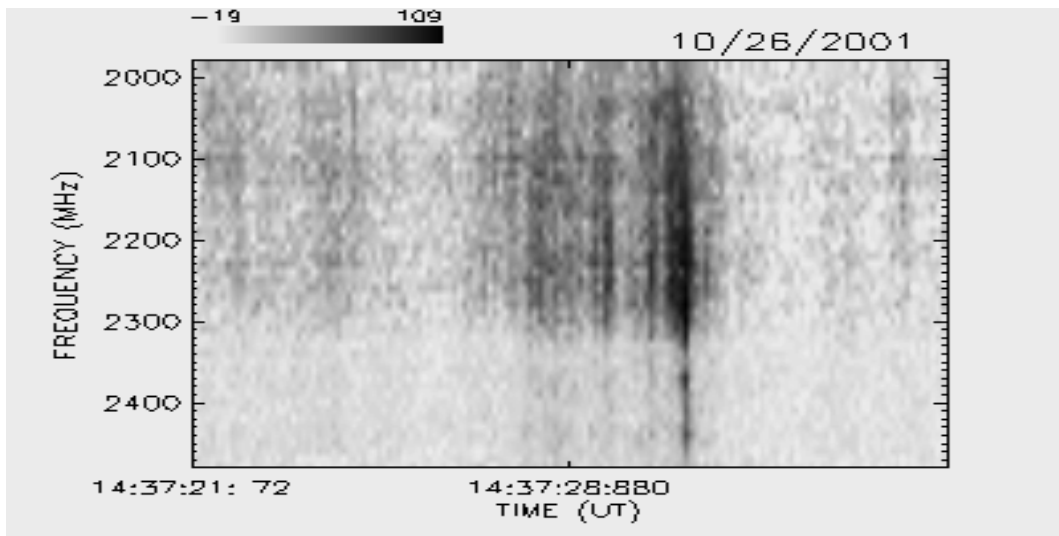
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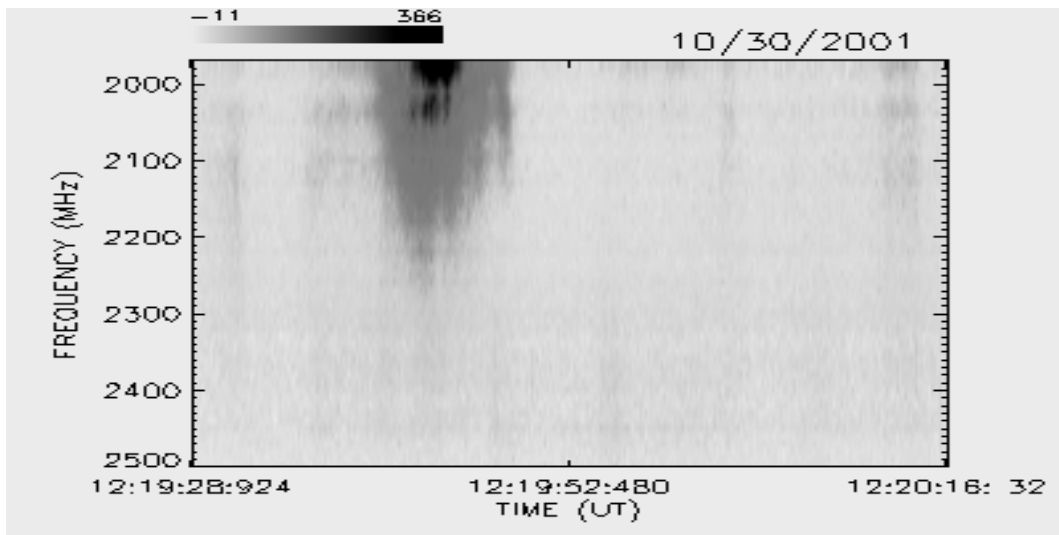
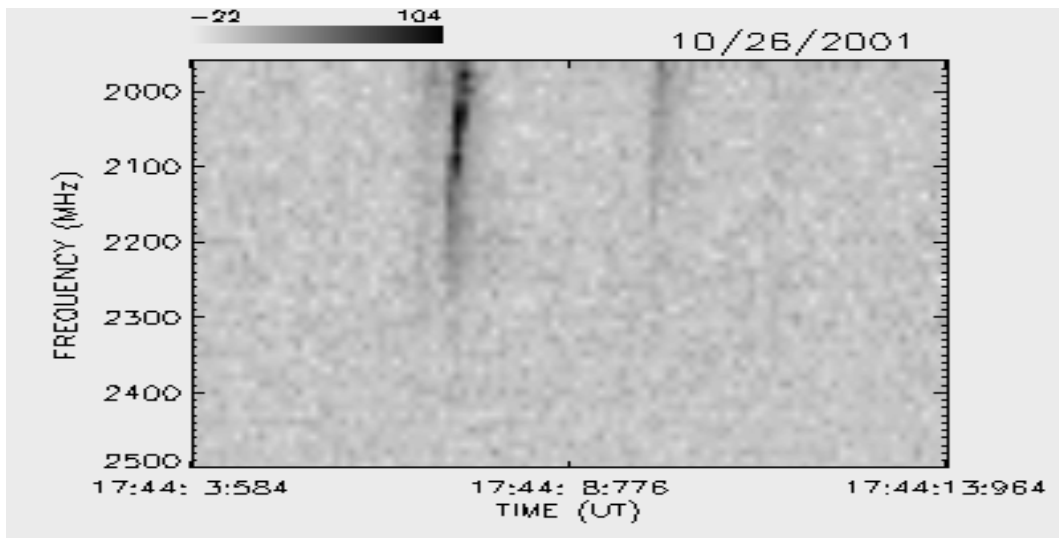
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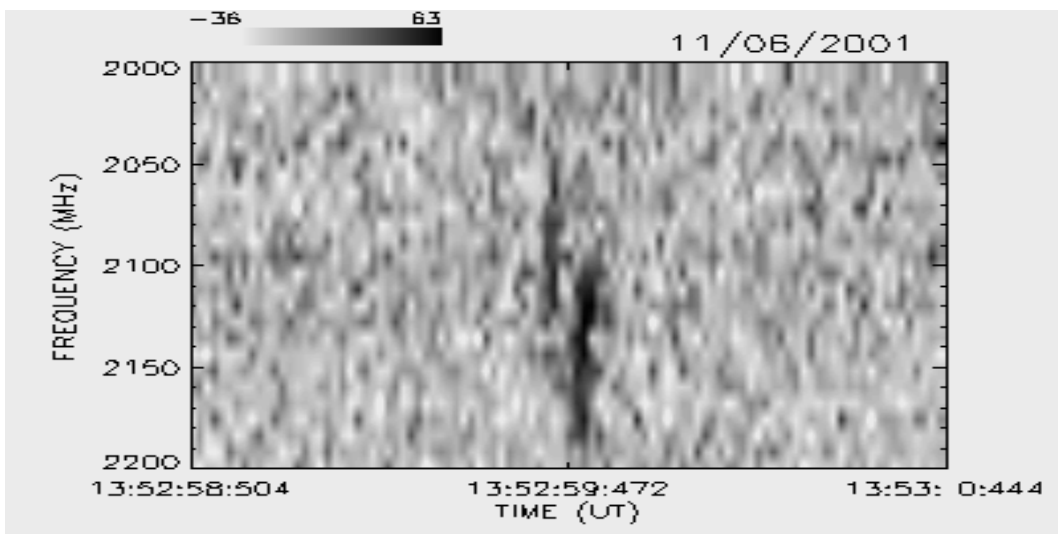
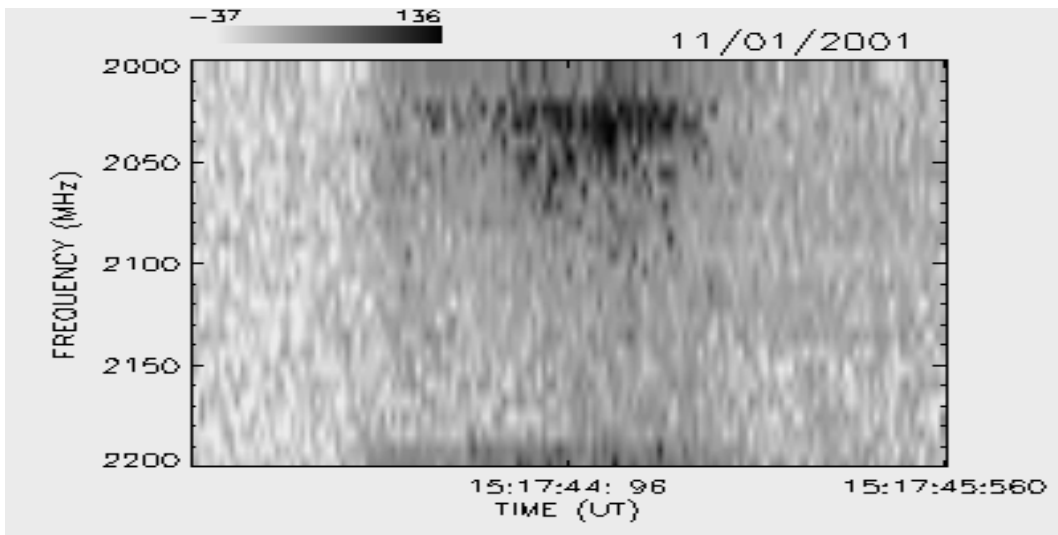
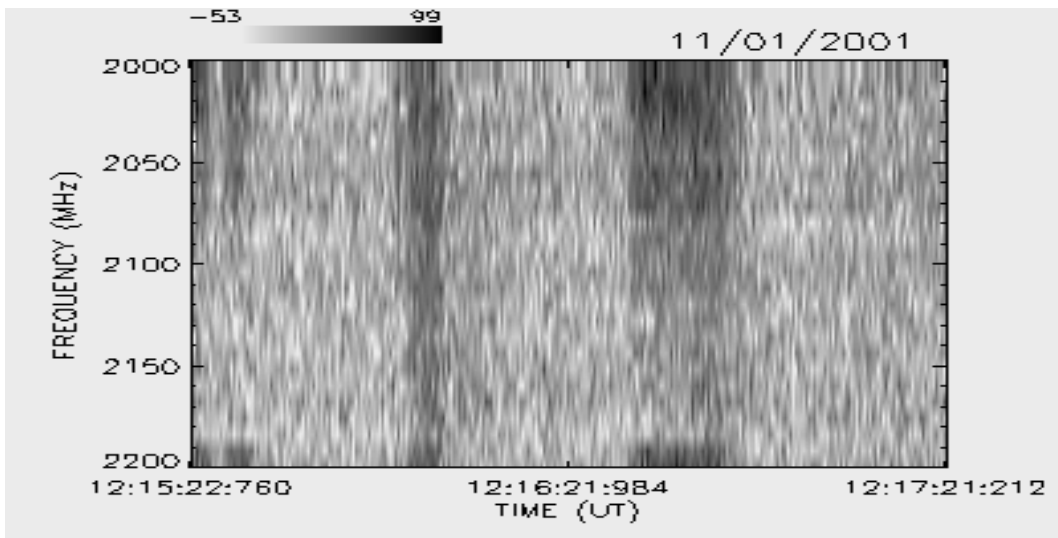
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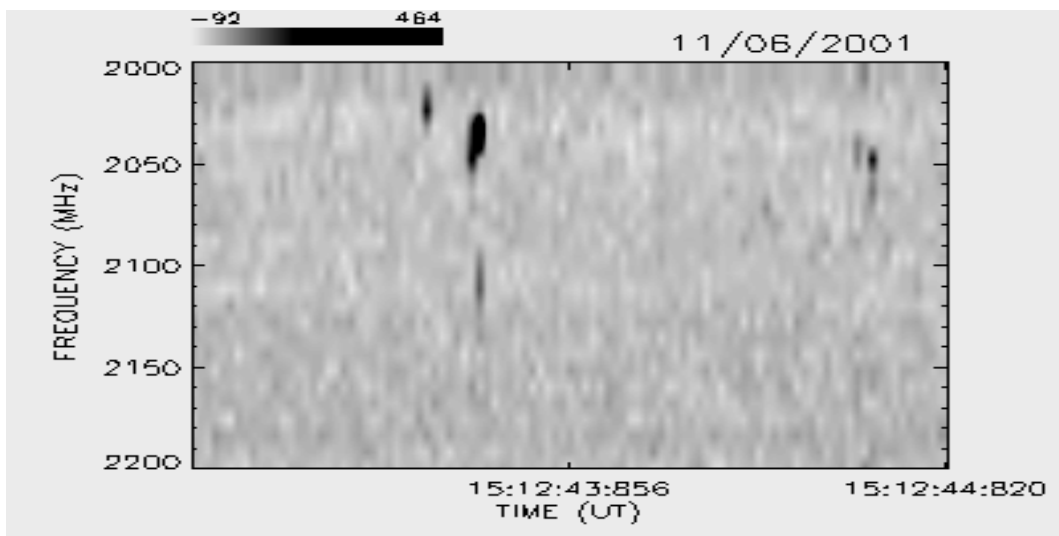
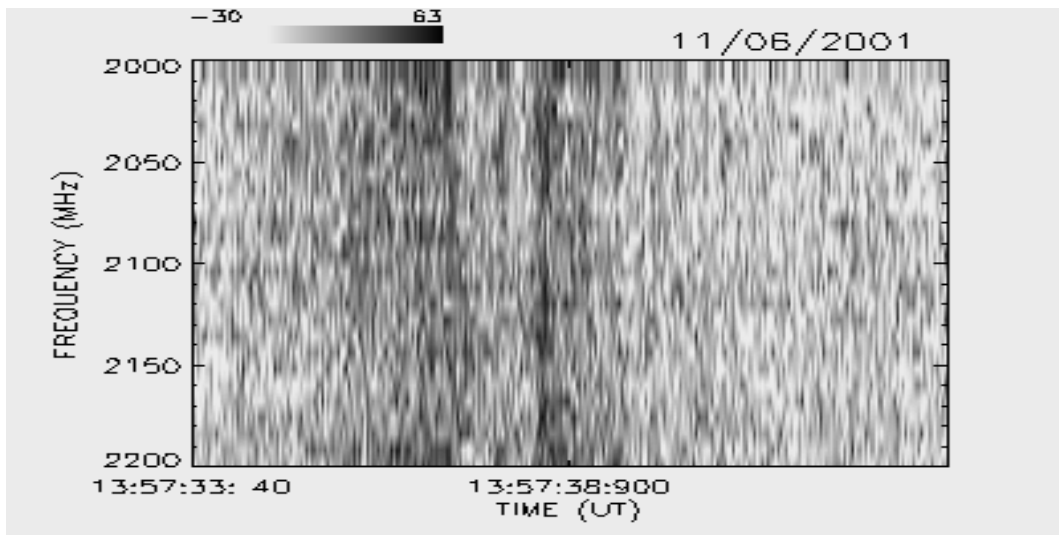
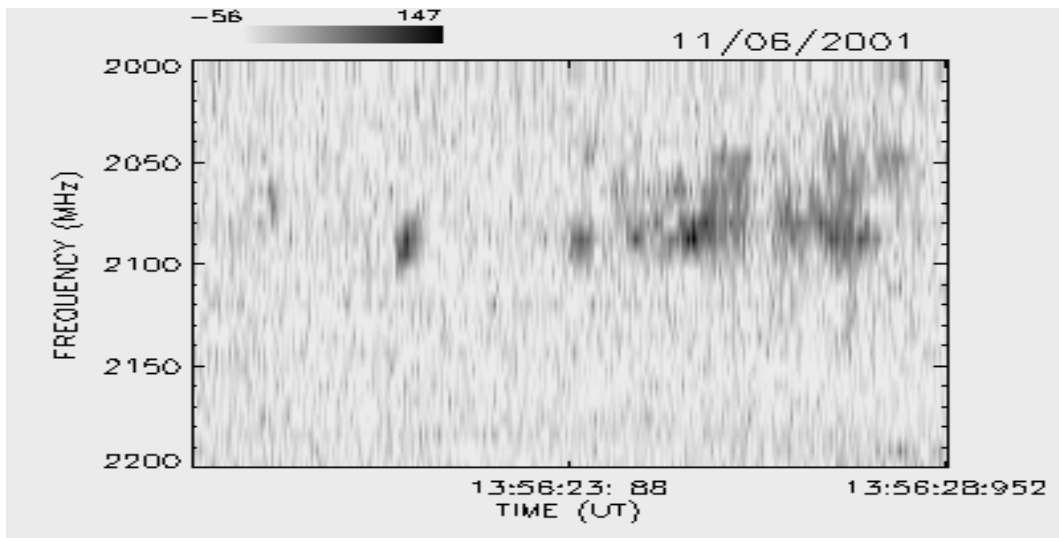
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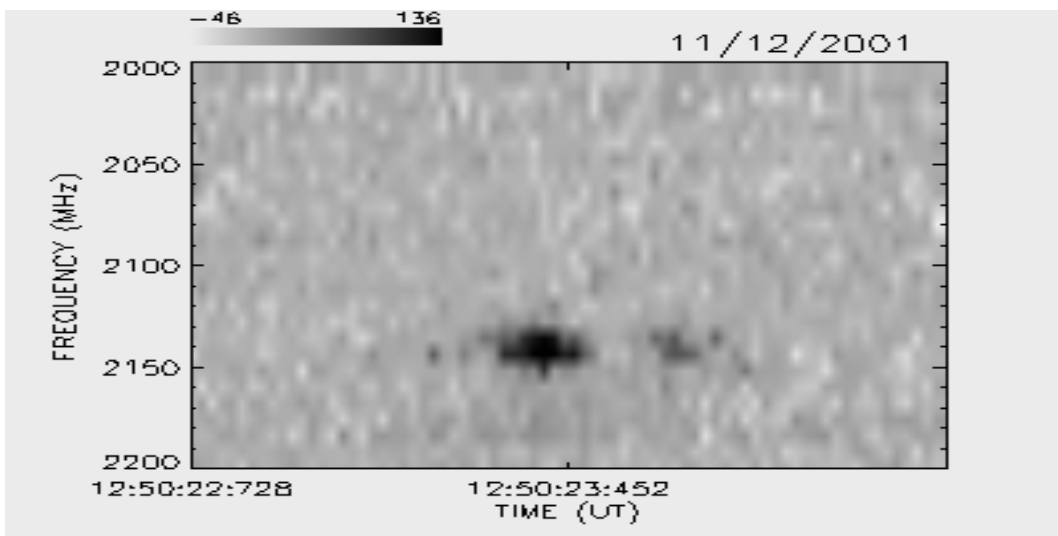
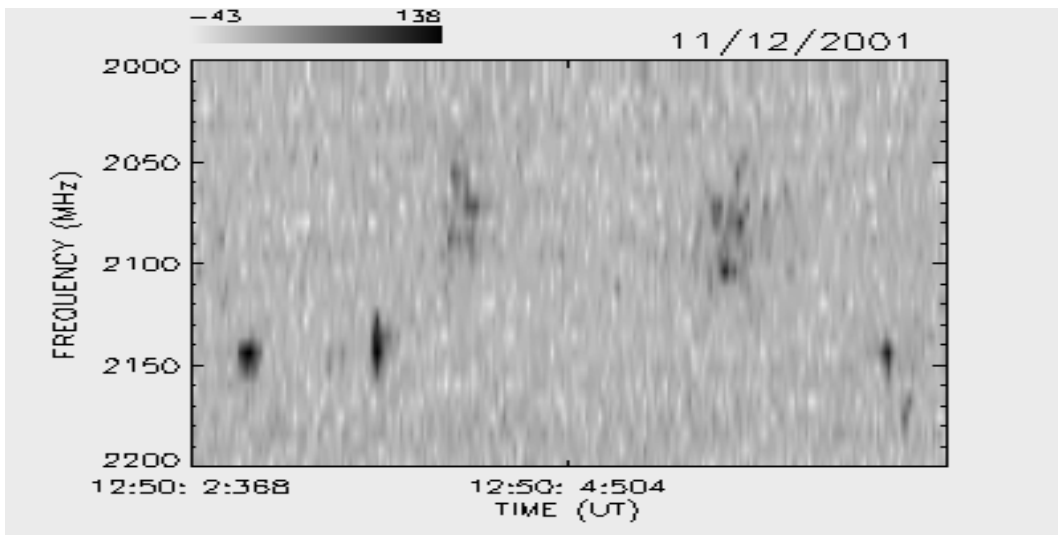
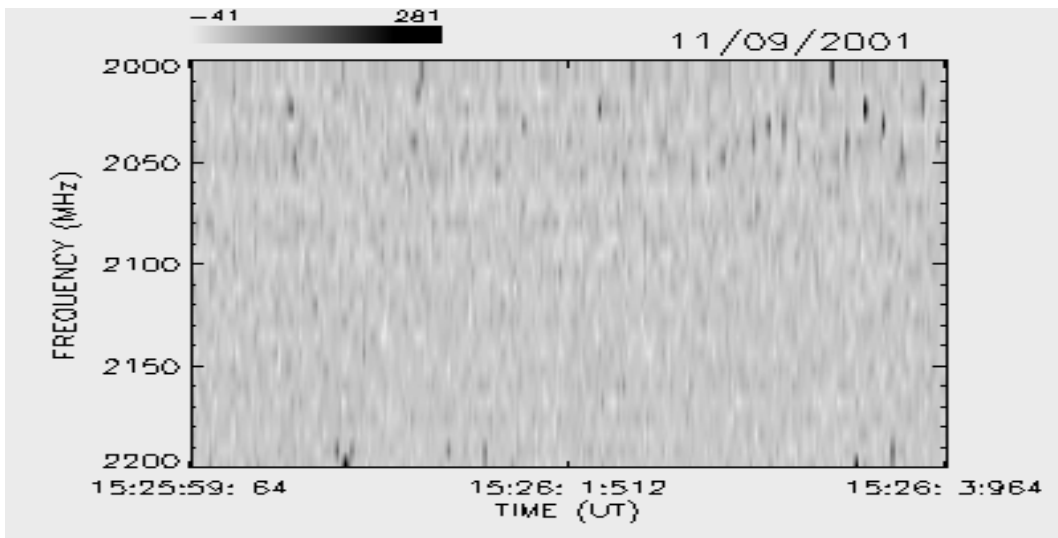
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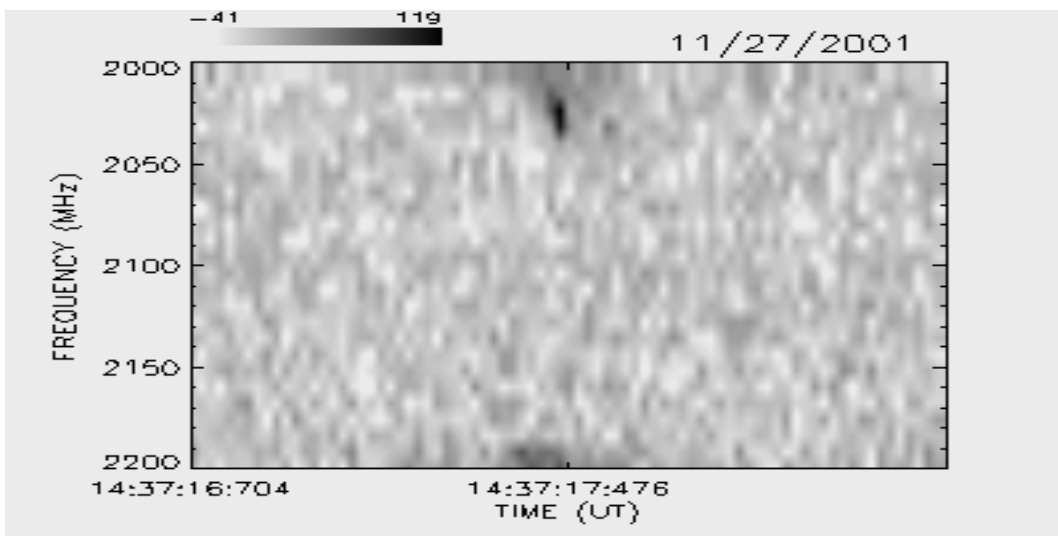
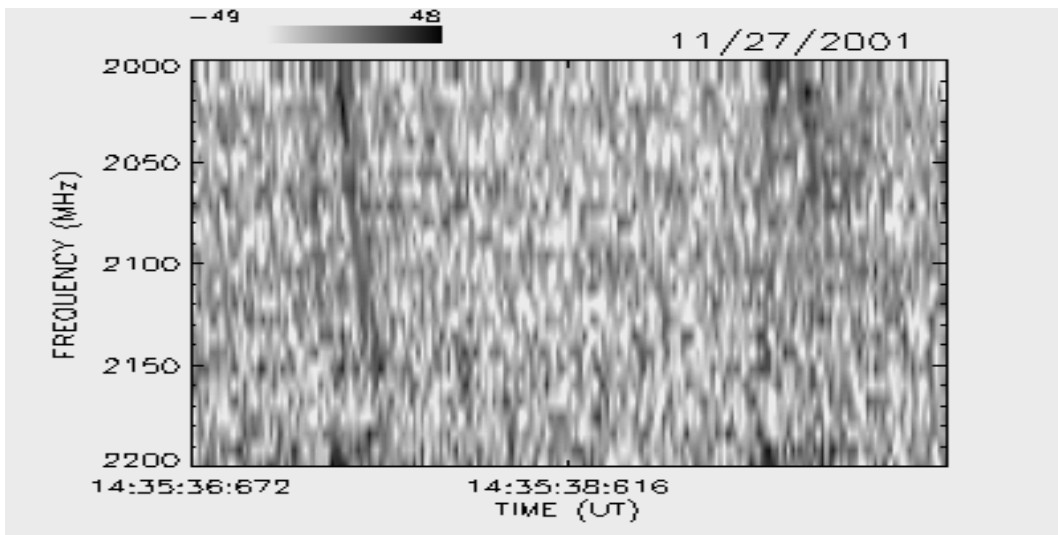
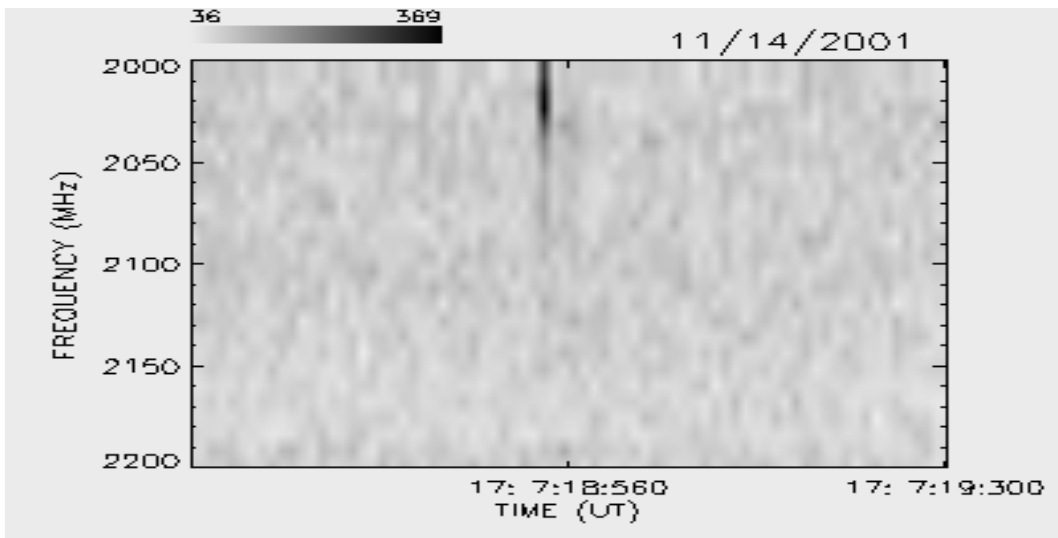
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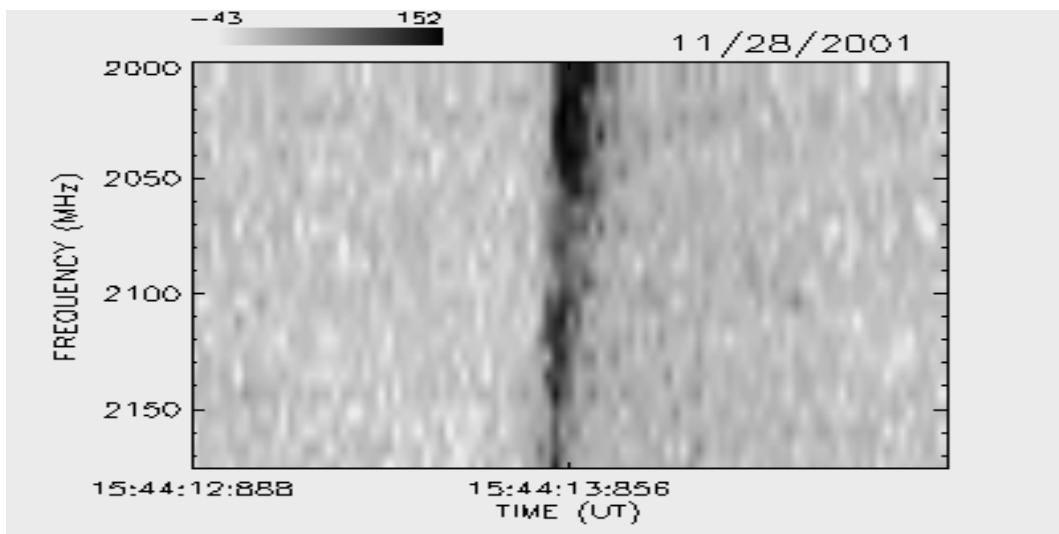
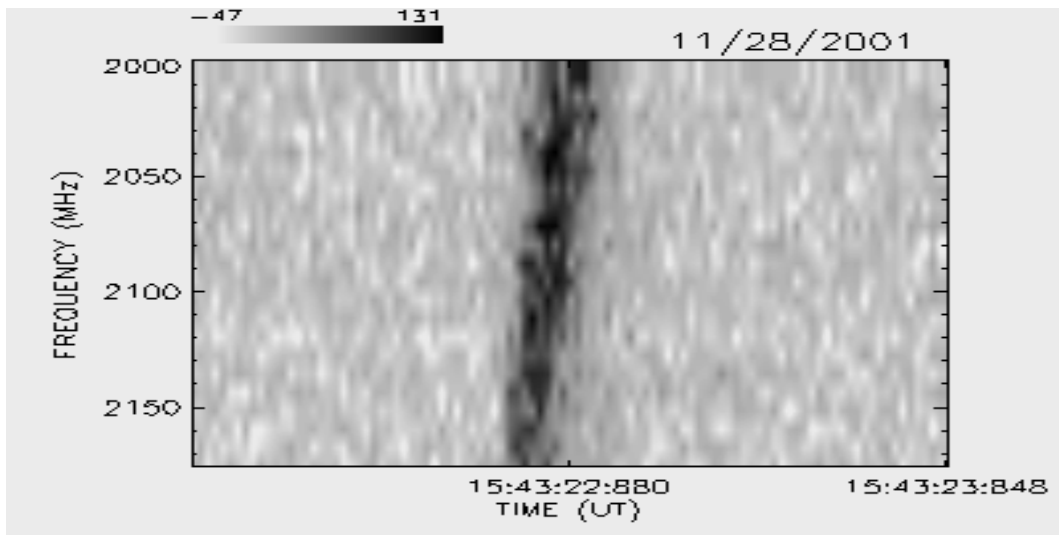
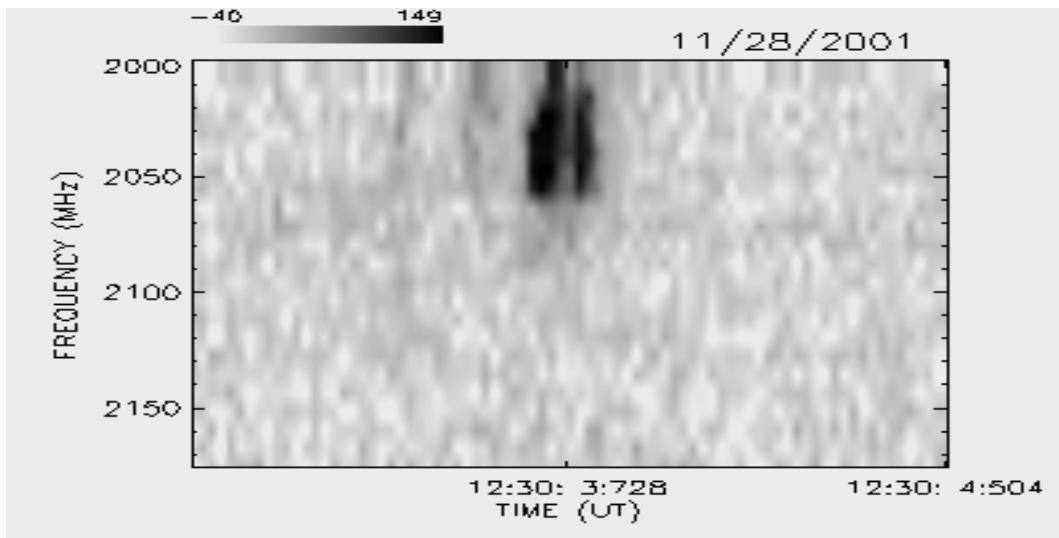
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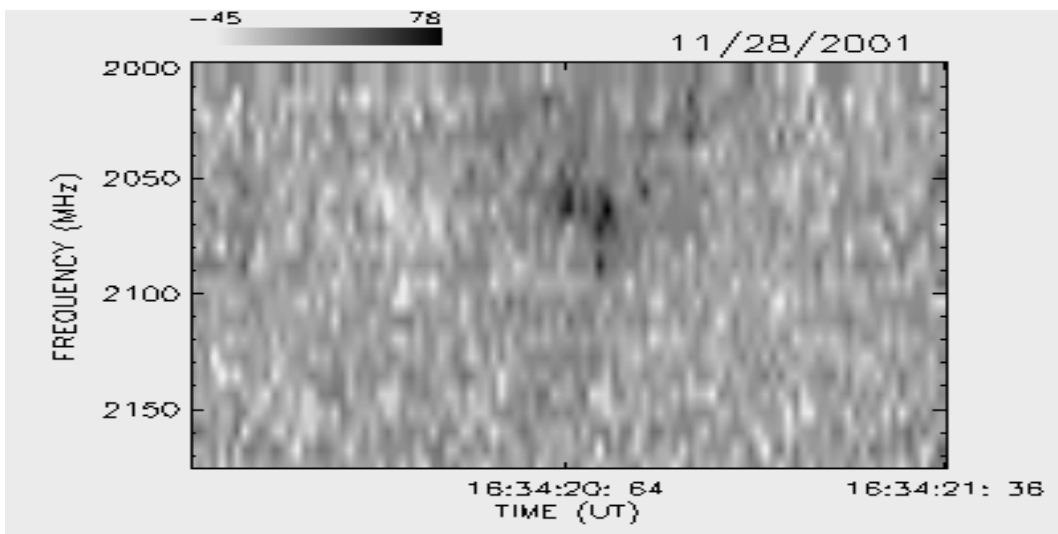
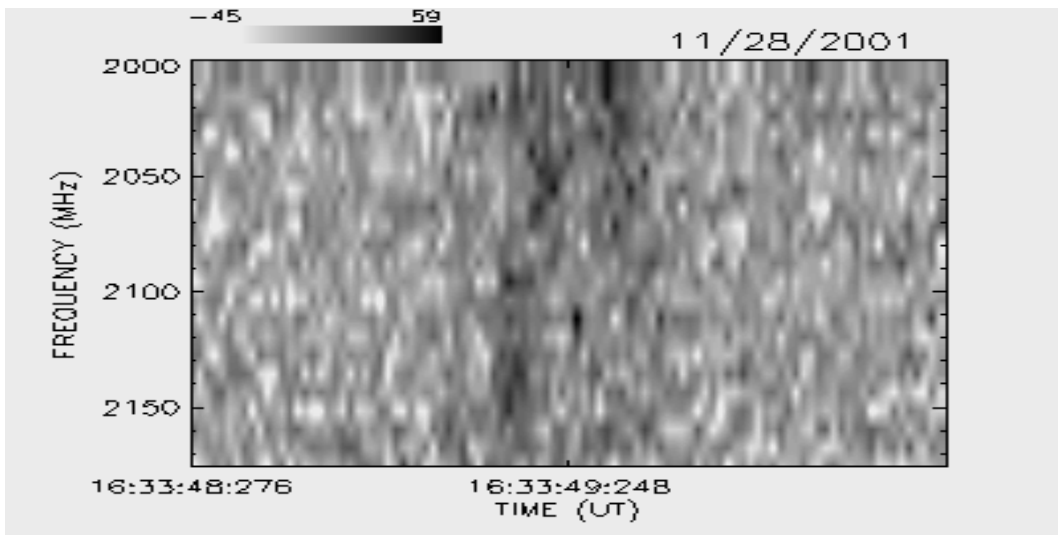
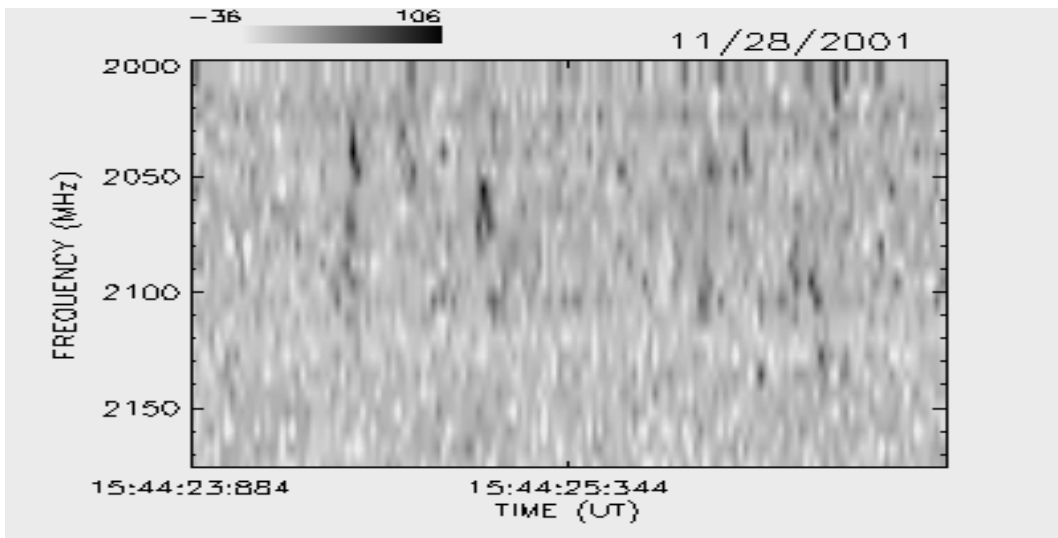
NOVEMBRO / 2001



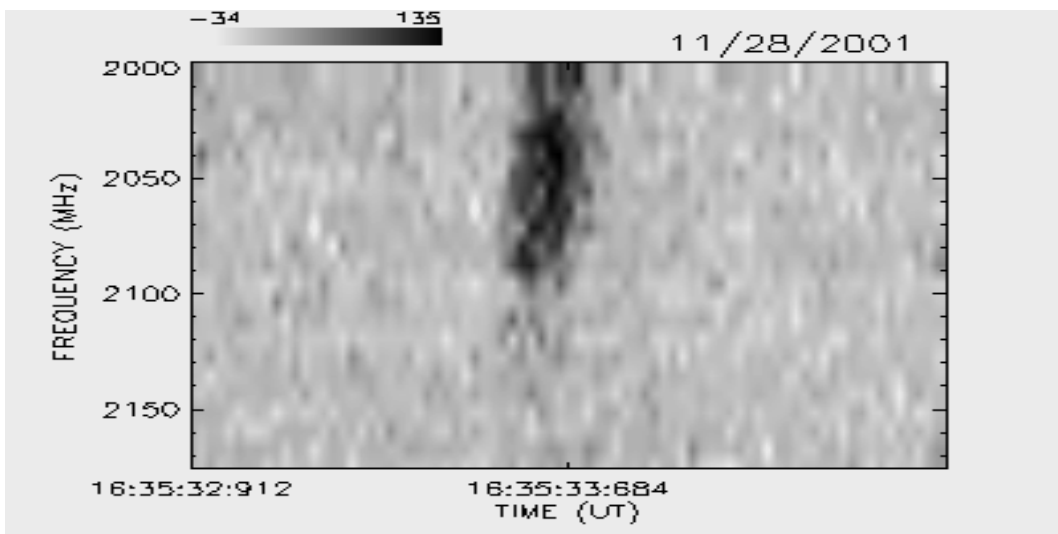
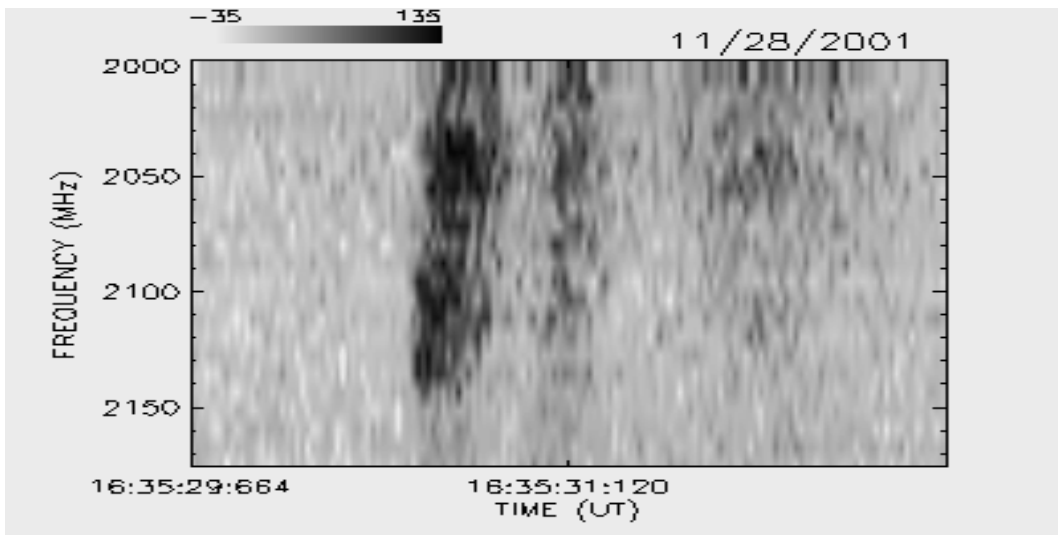
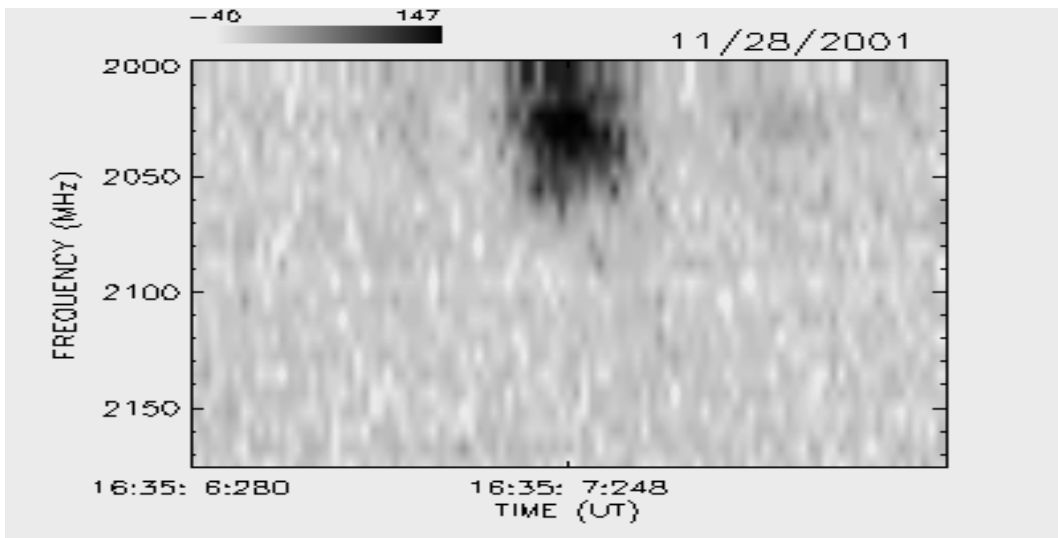
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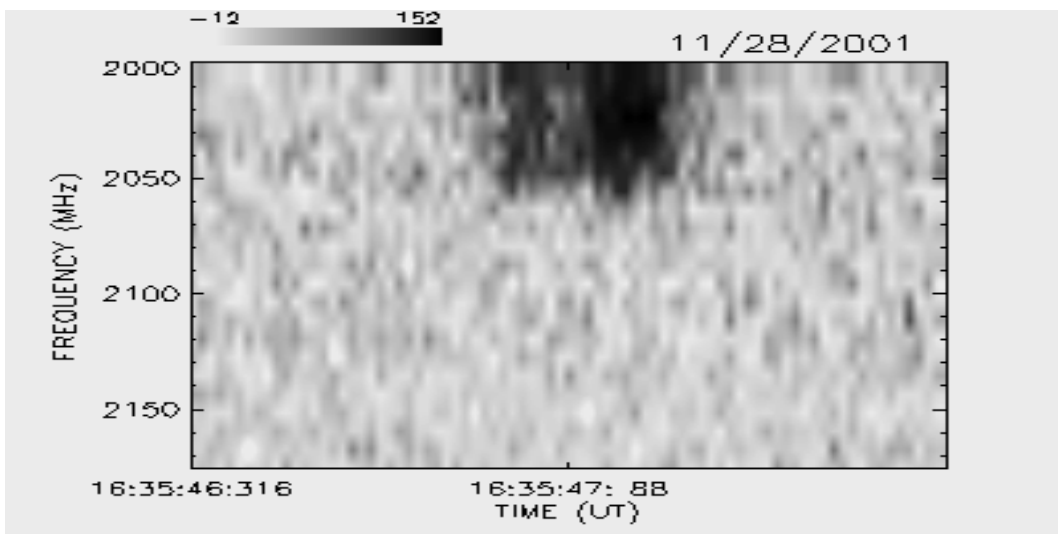
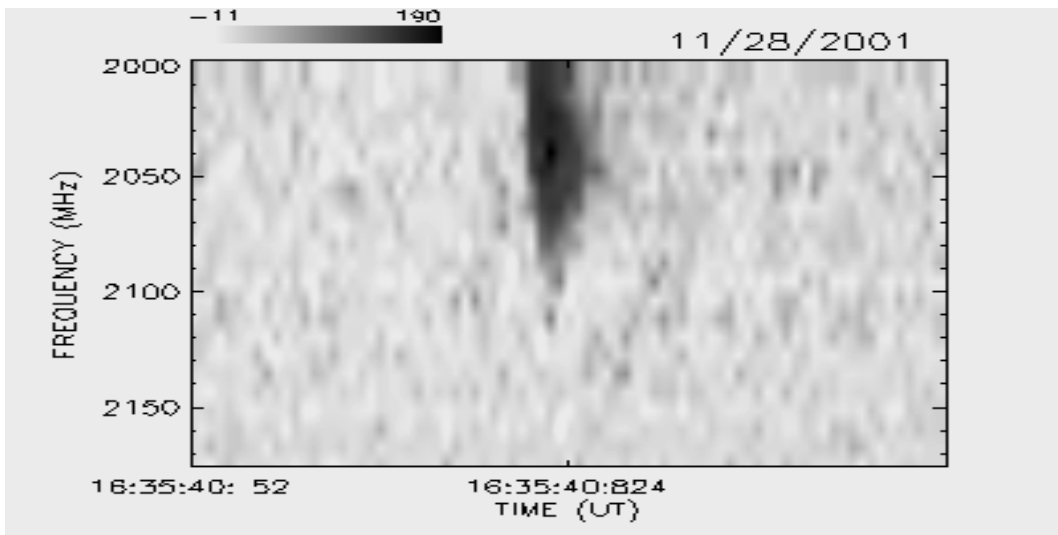
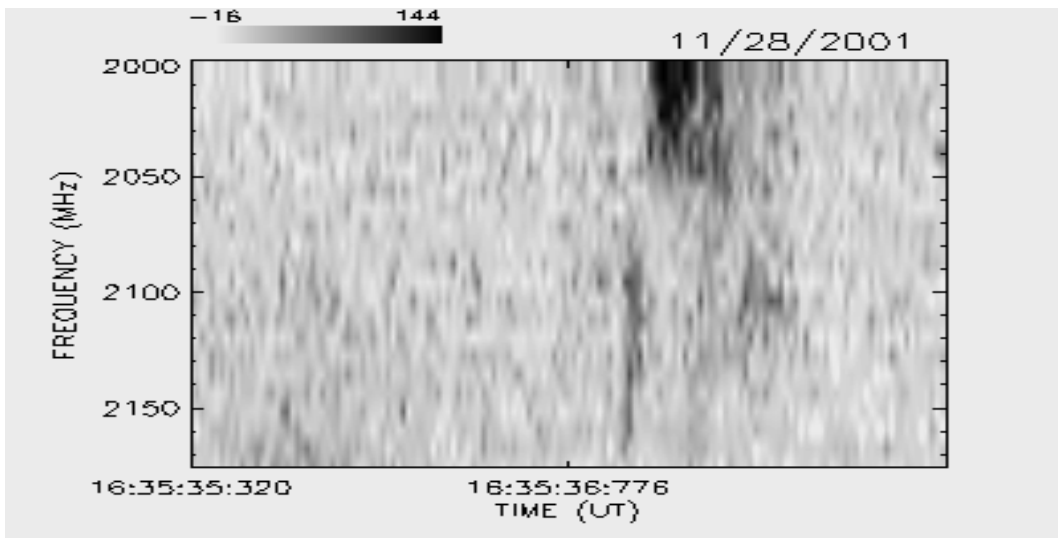
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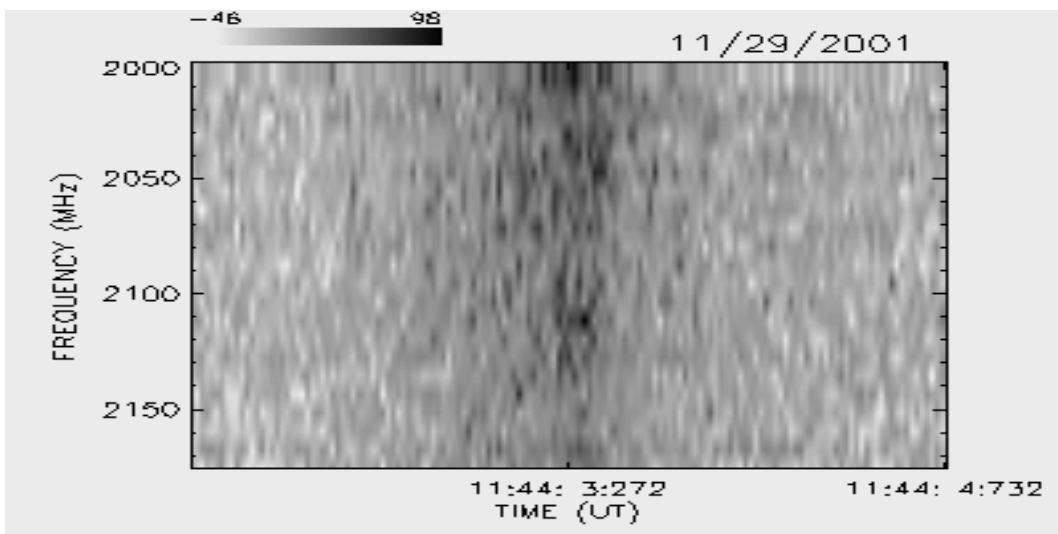
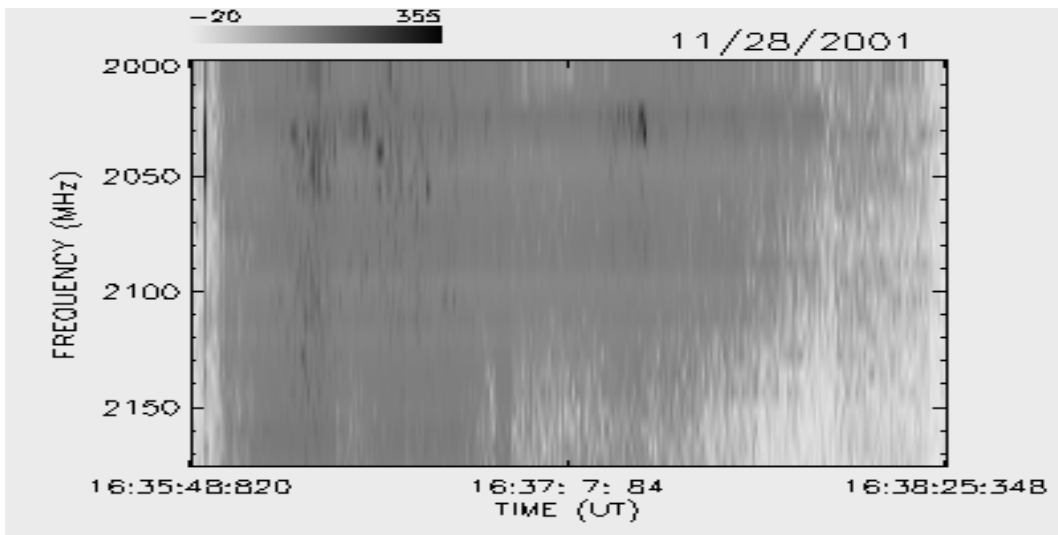
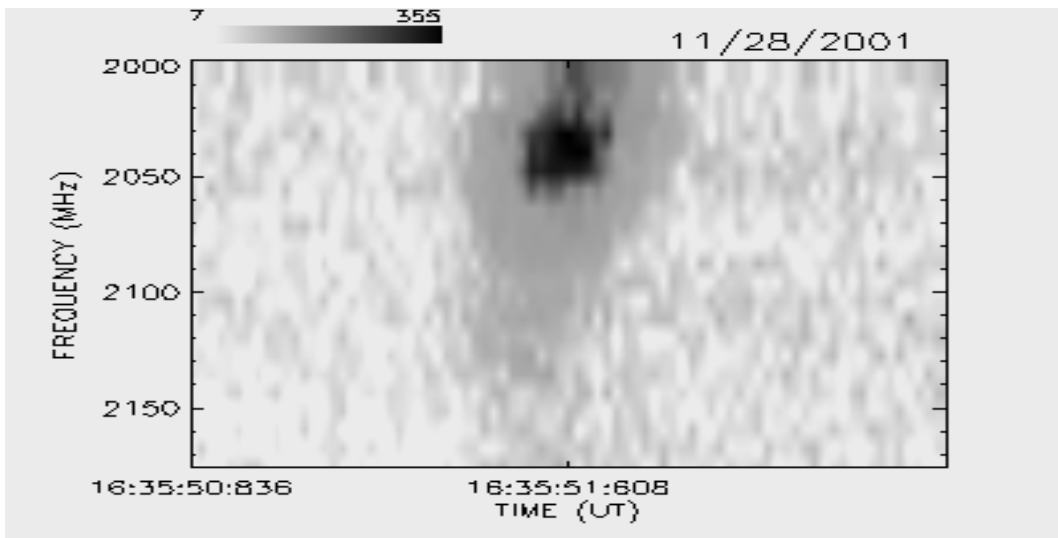
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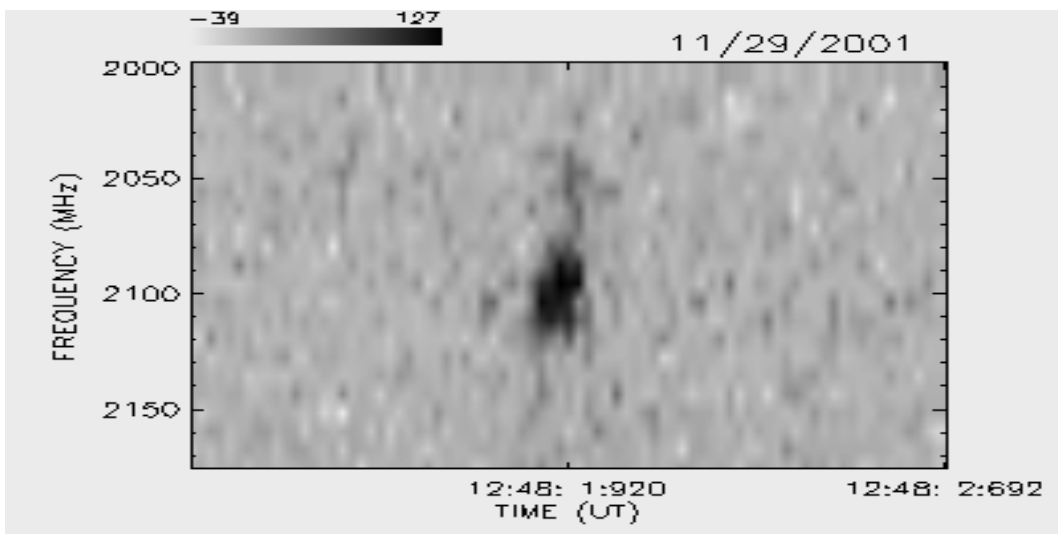
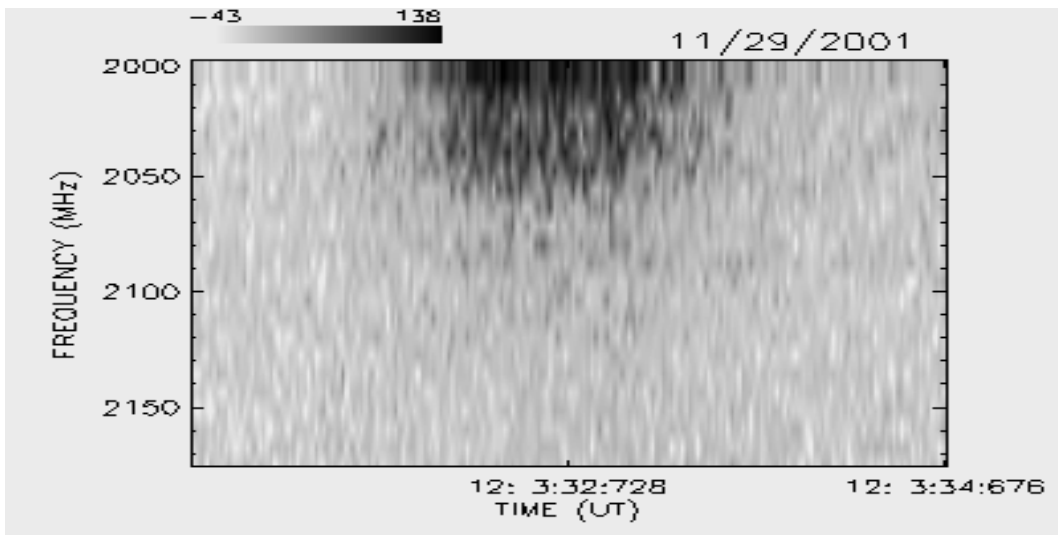
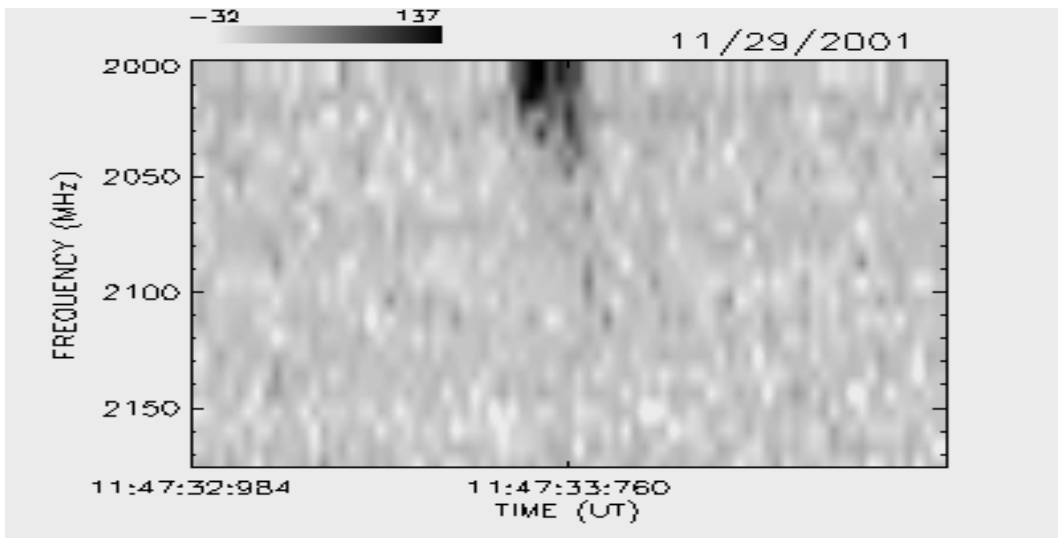
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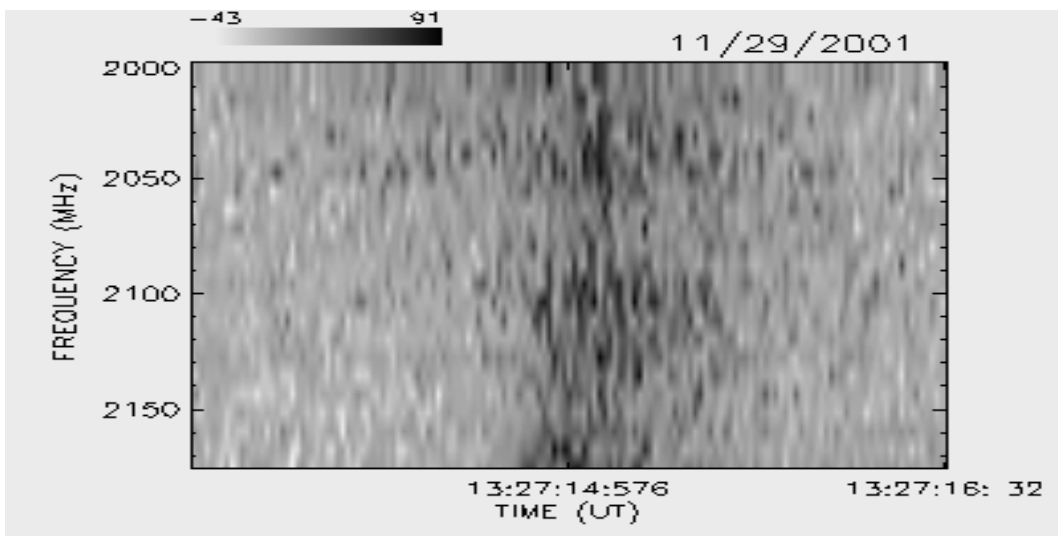
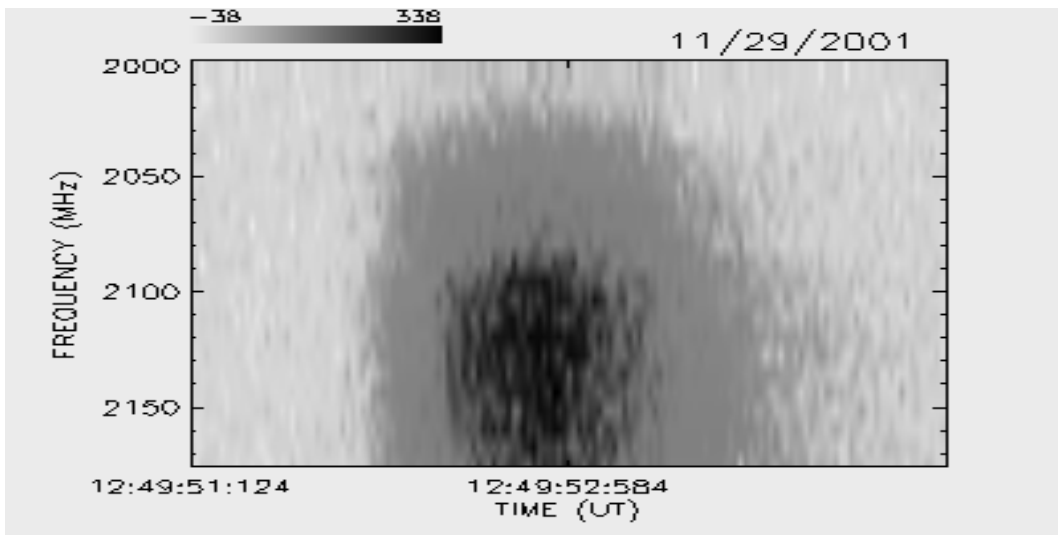
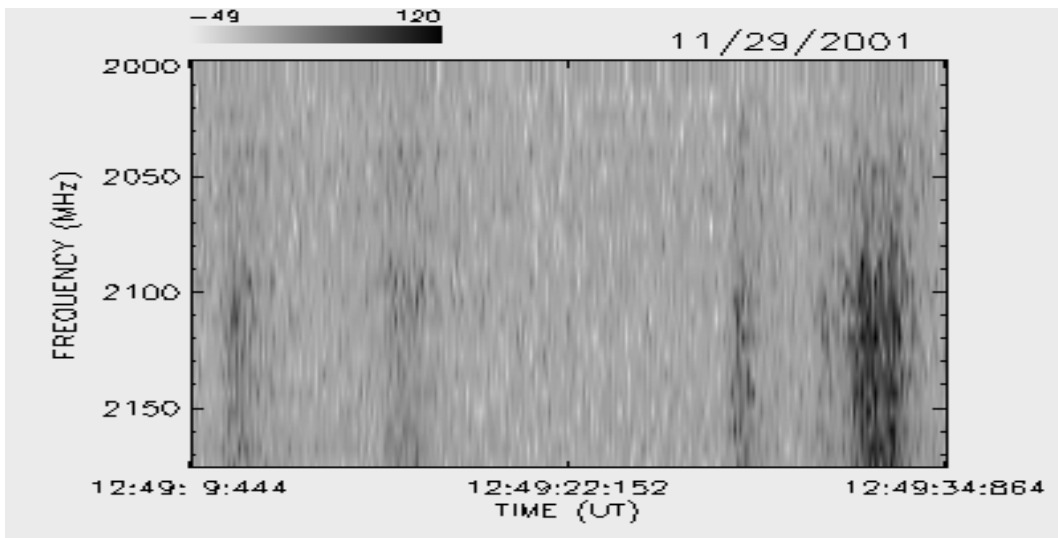
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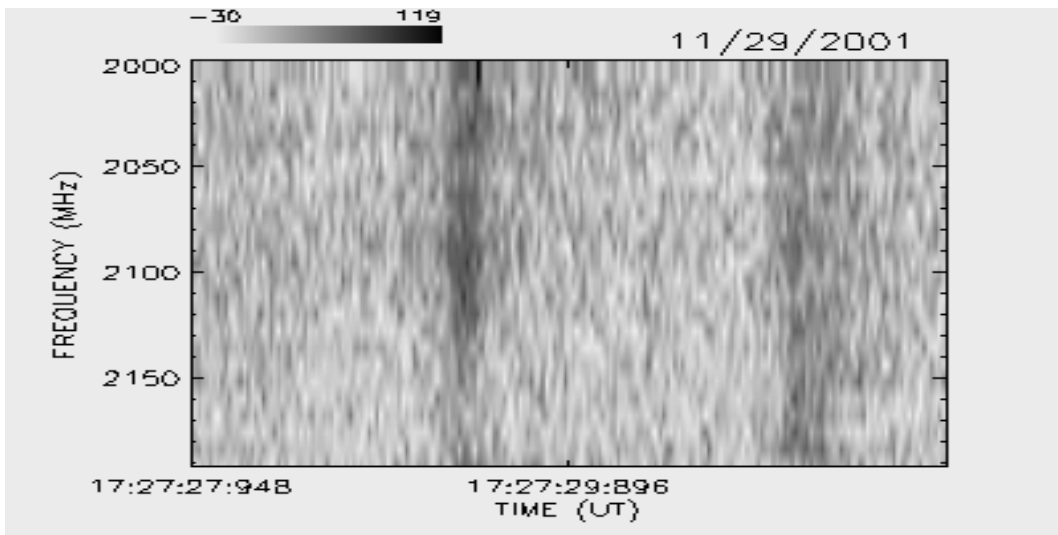
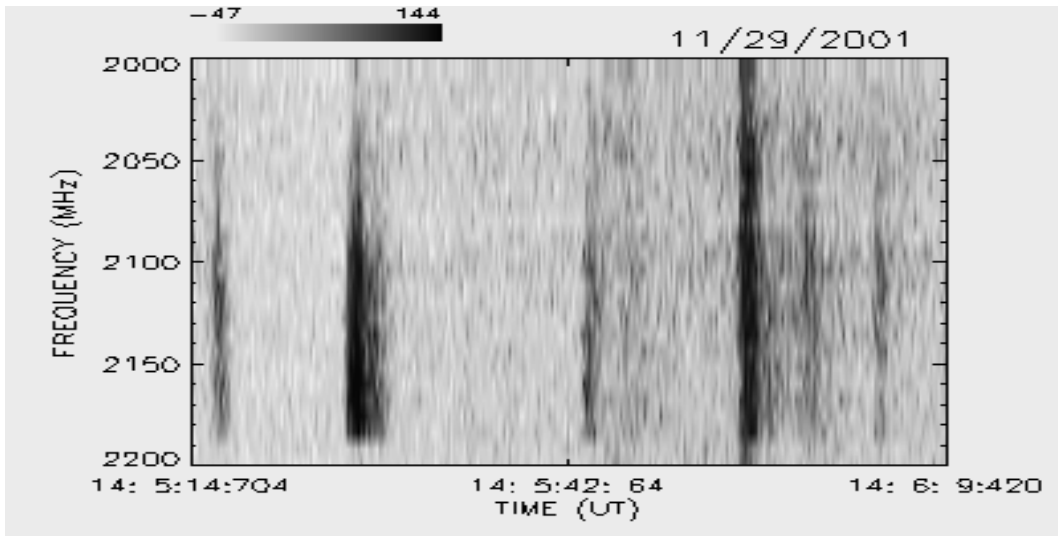
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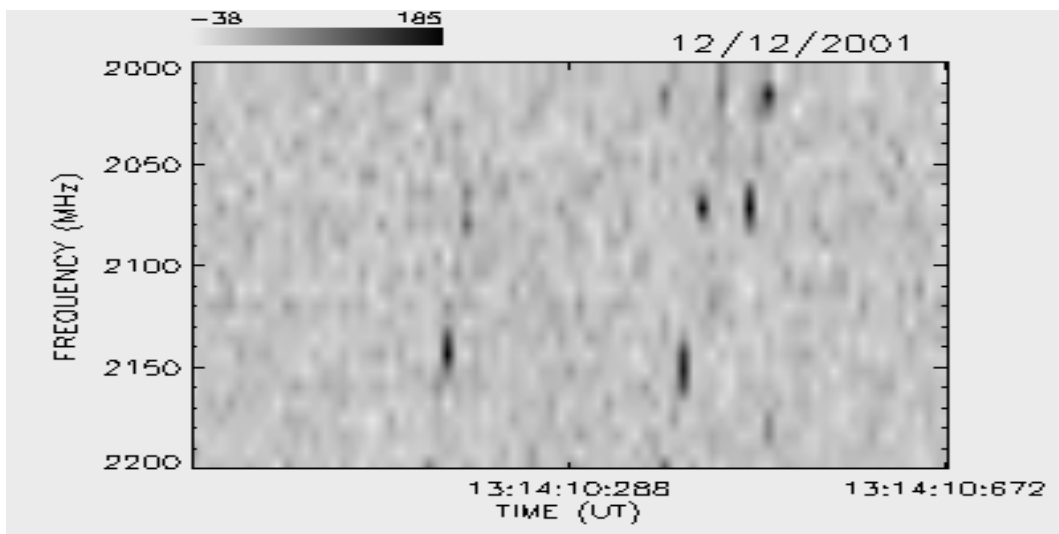
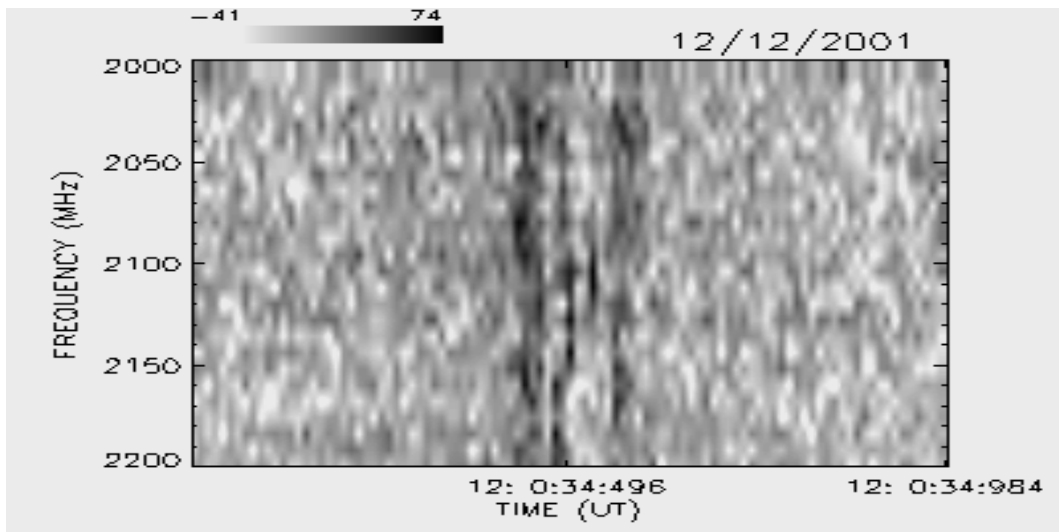
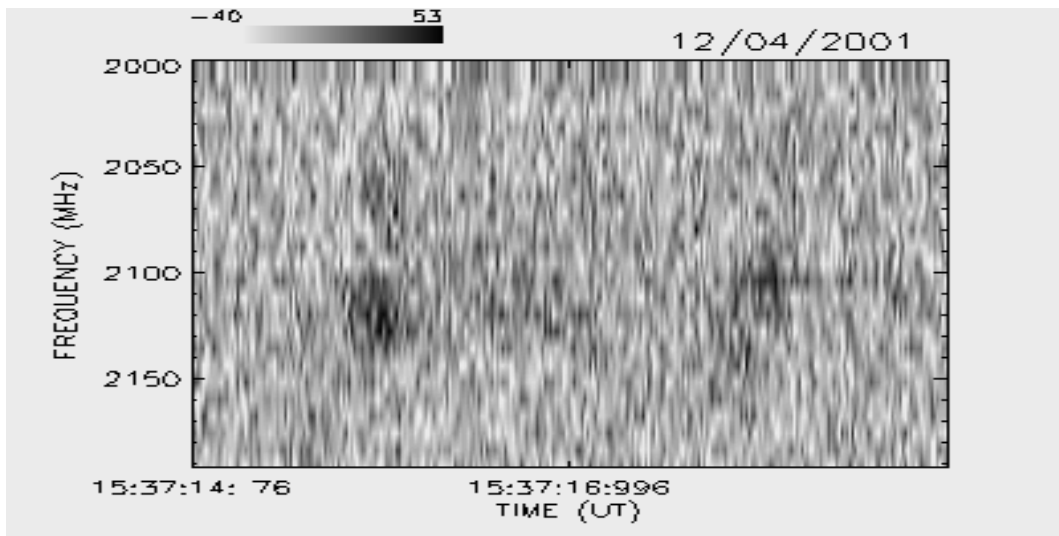
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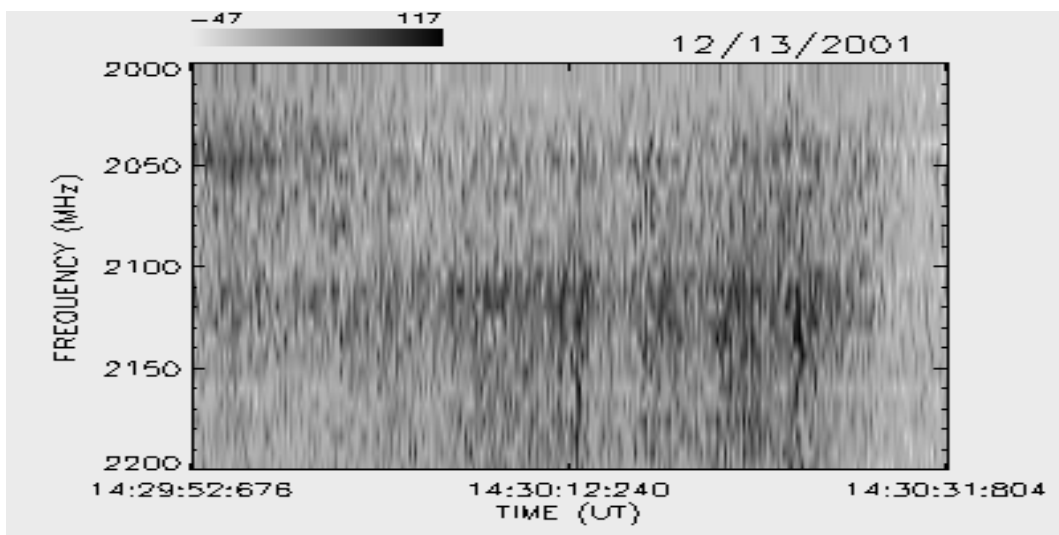
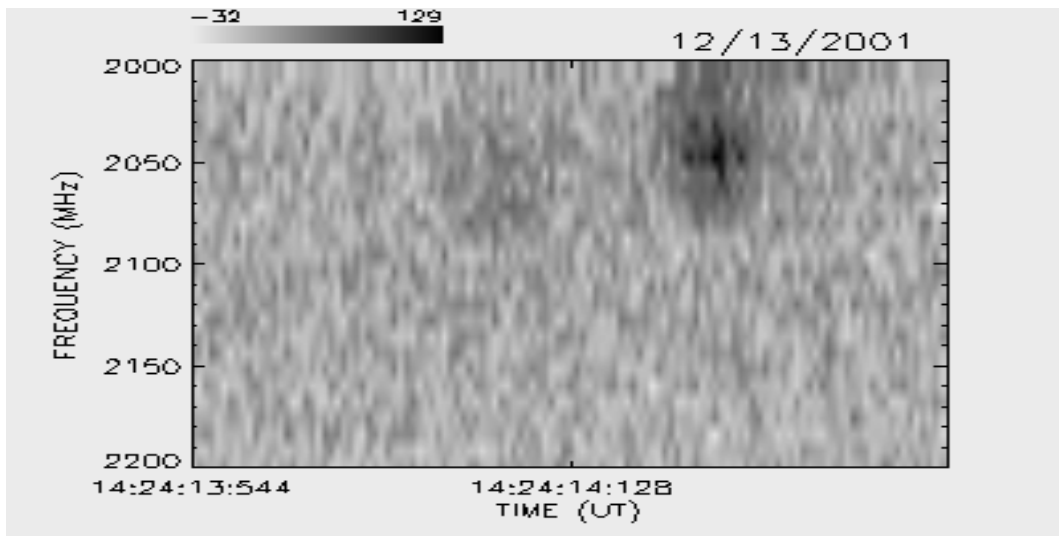
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