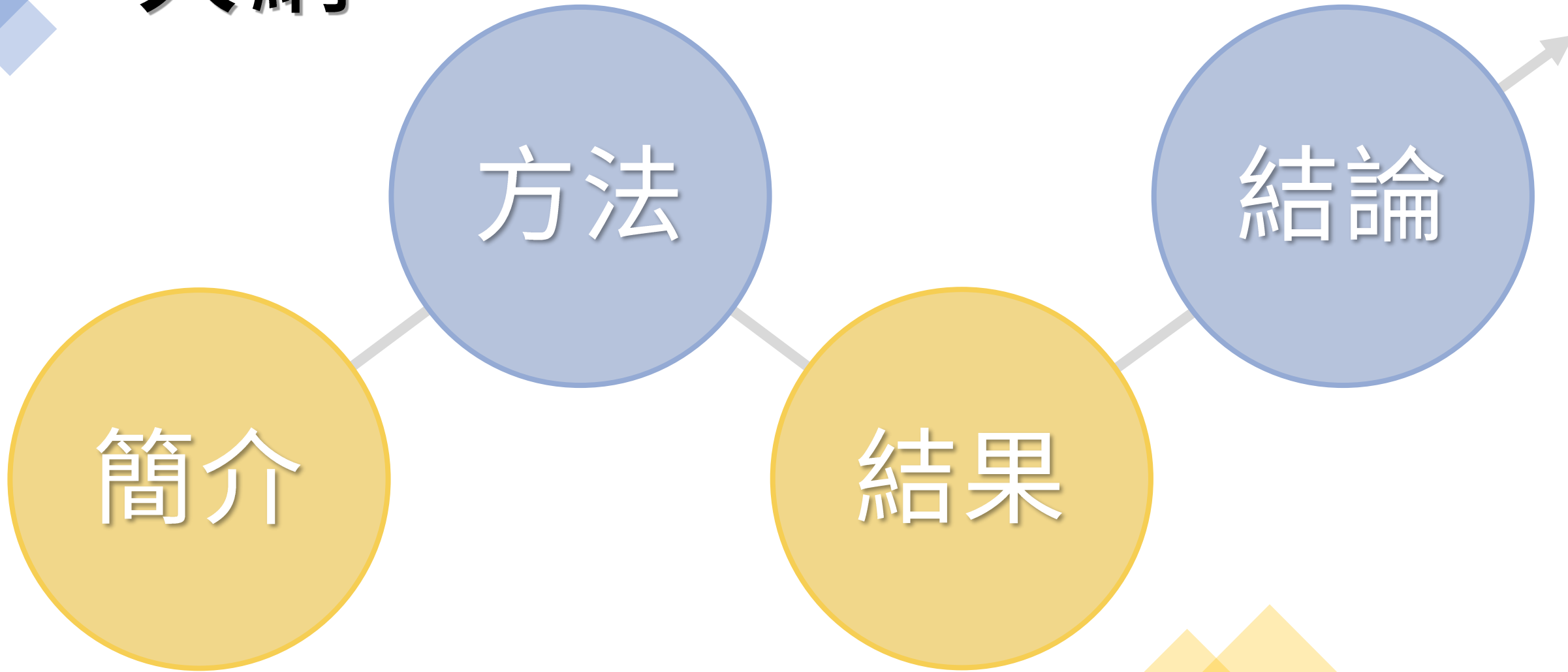
SS2012 IDL程式語言I 專題製作的成果報告

第二型太陽無線電暴特性分析

專題學生：張耀文

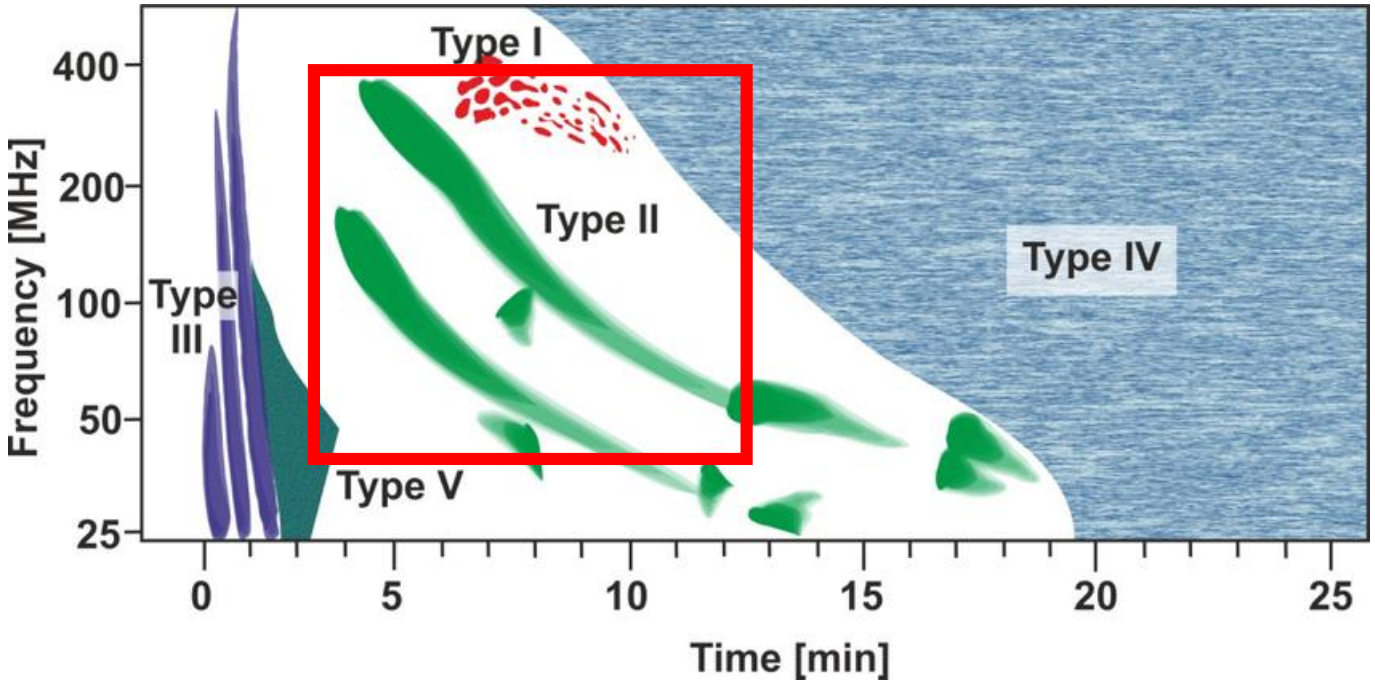
任課老師：許志浤

大綱

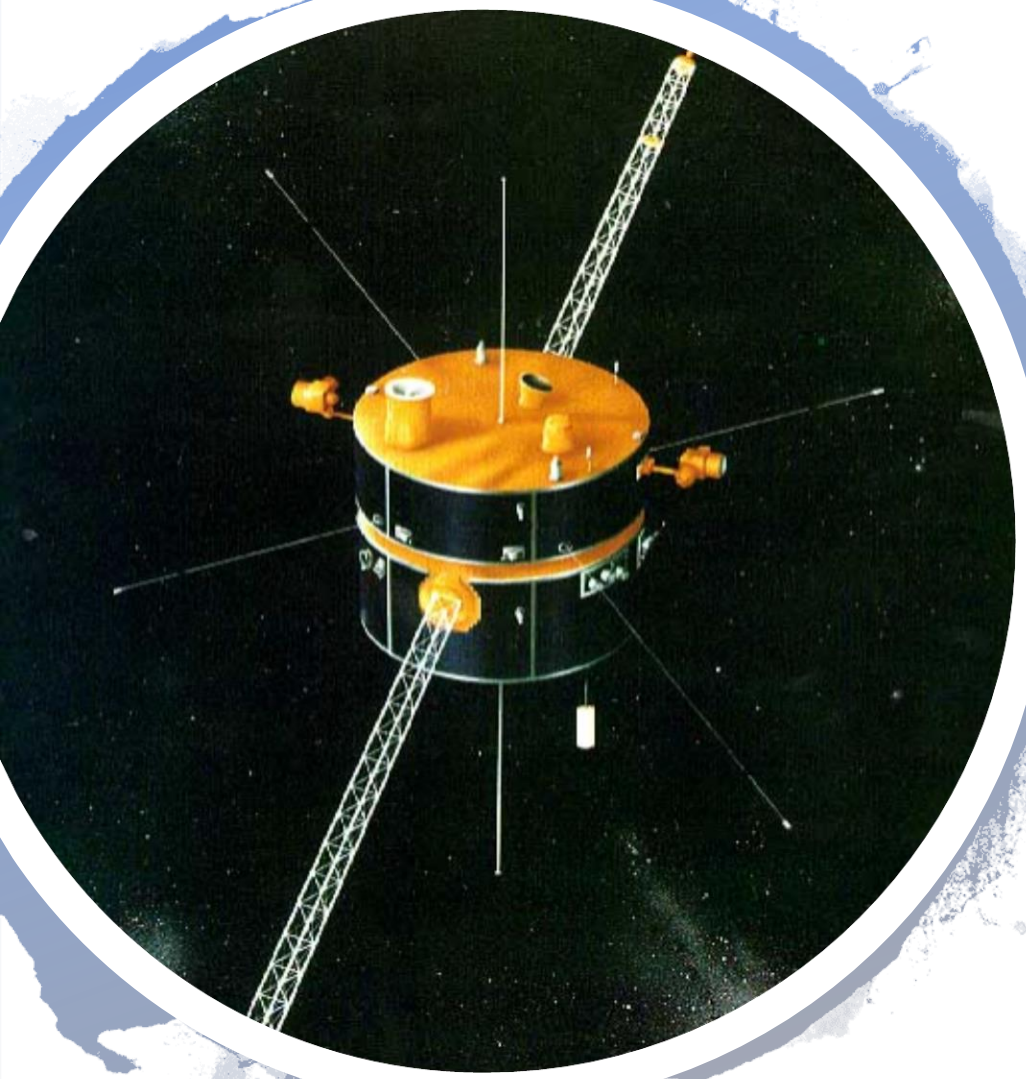


簡介

- 太陽無線電暴(Solar Radio Burst)是一種在動態頻譜圖中隨時間變化的結構
- 第二型太陽無線電暴在動態頻譜圖中會隨時間由高頻緩慢漂移至低頻



https://www.researchgate.net/figure/Schematic-diagram-shows-the-basic-classification-of-solar-radio-bursts-in-the-frequency_fig1_304027763



Wind

- 位於第一拉格朗日點的衛星
- 發射時間：1994 年 11 月 1 日

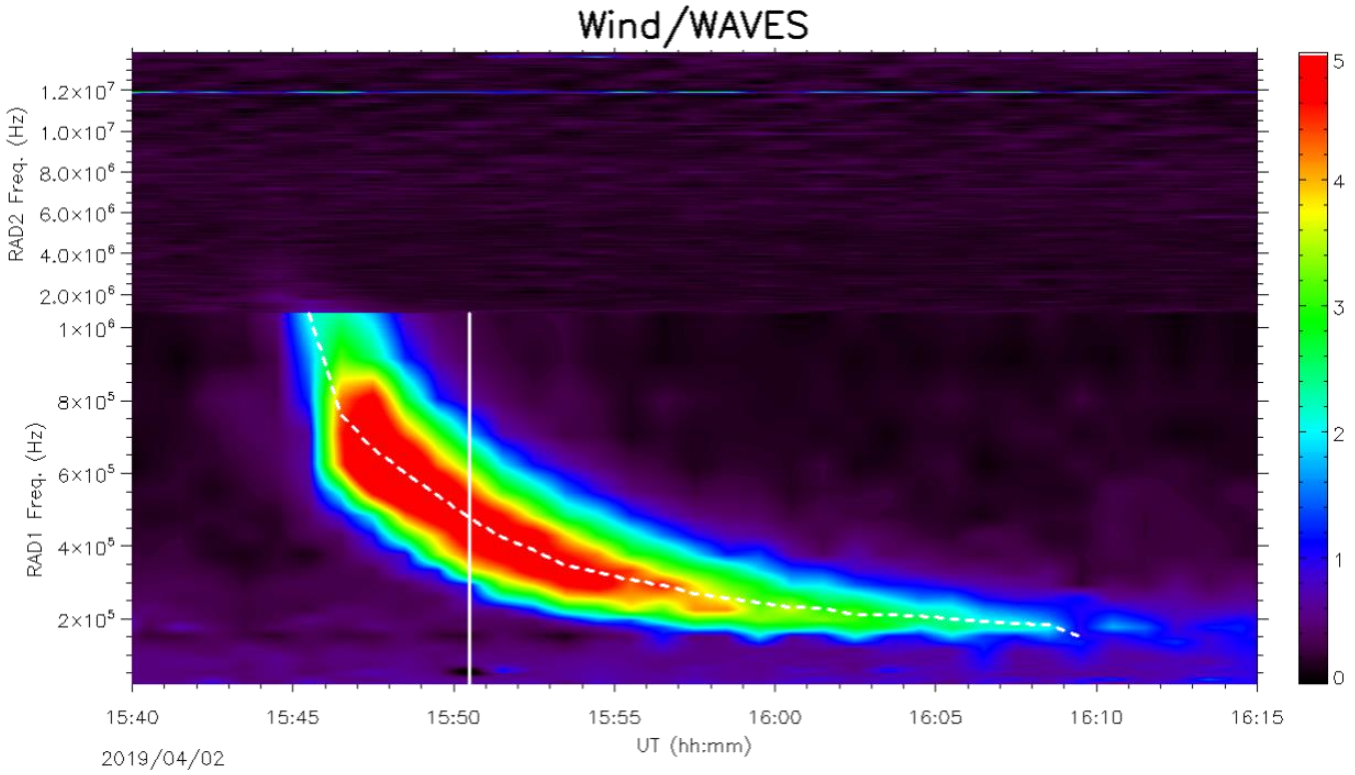
科 學 酬 載 儀 器

Radio and Plasma WAVES

RAD1
20 kHz–1040 kHz

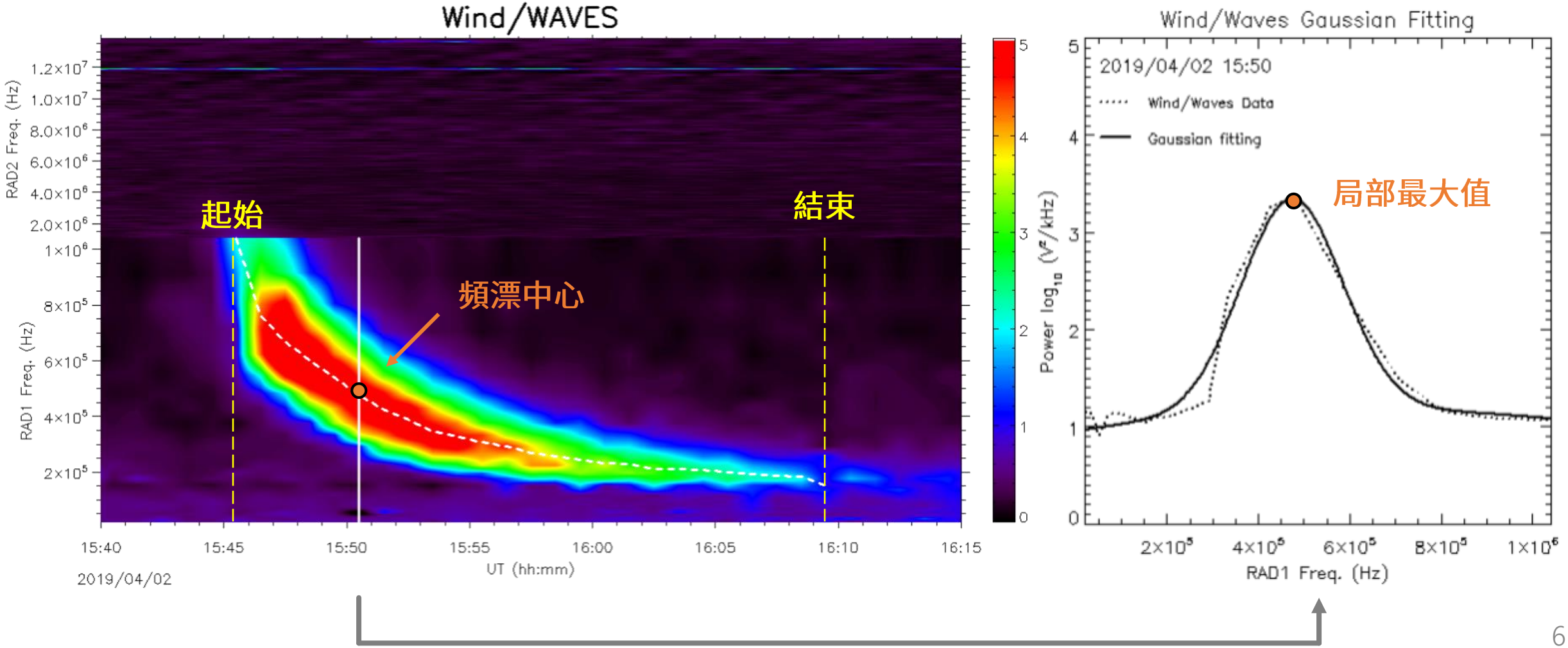
RAD2
1075 kHz–13.825 MHz

方法

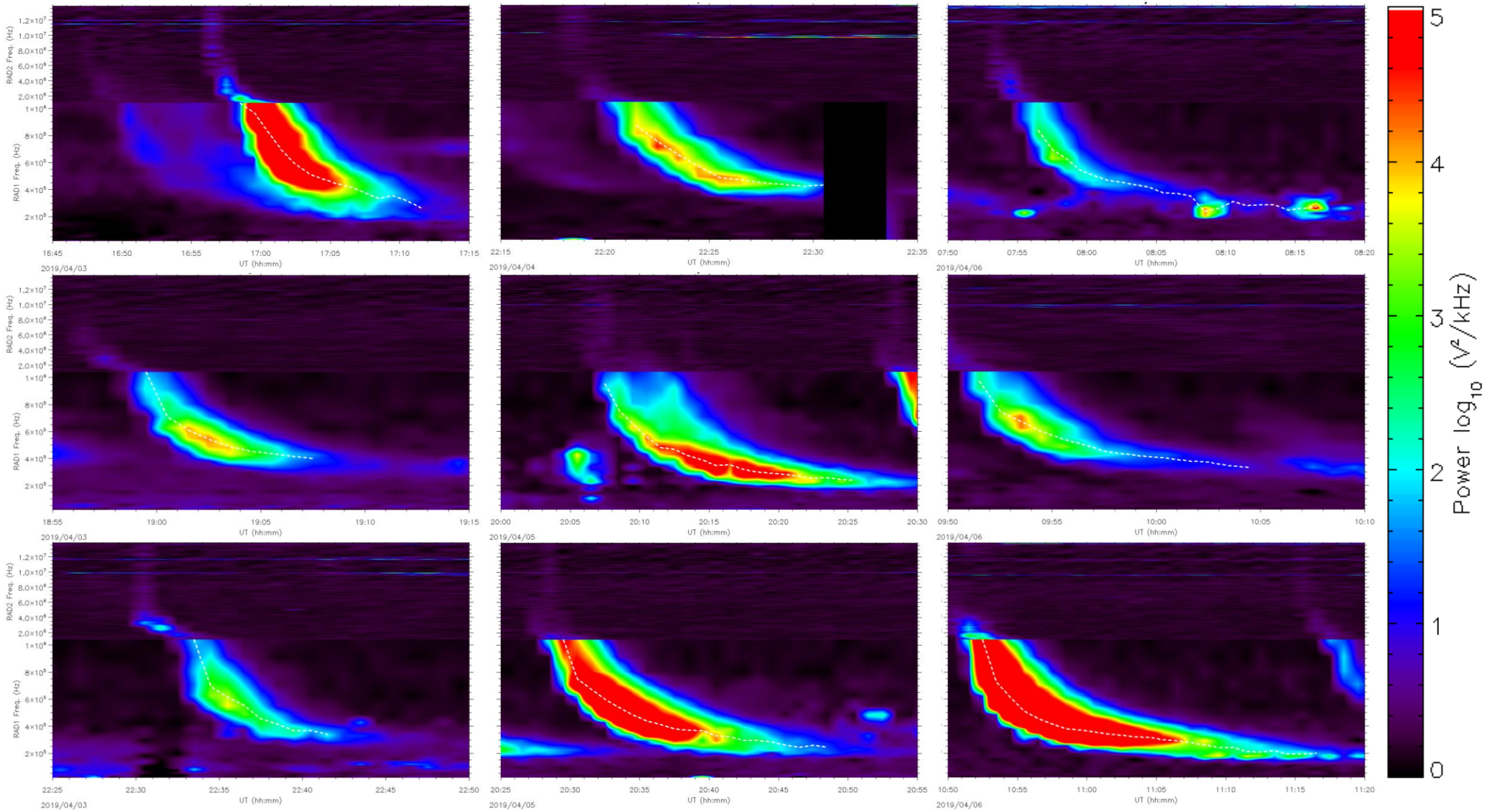


1. 標示事件起始與結束時間
2. 用高斯擬合找頻漂中心
3. 繪製時間段內的頻漂軌跡
4. 擬合頻漂函數$f(t)$

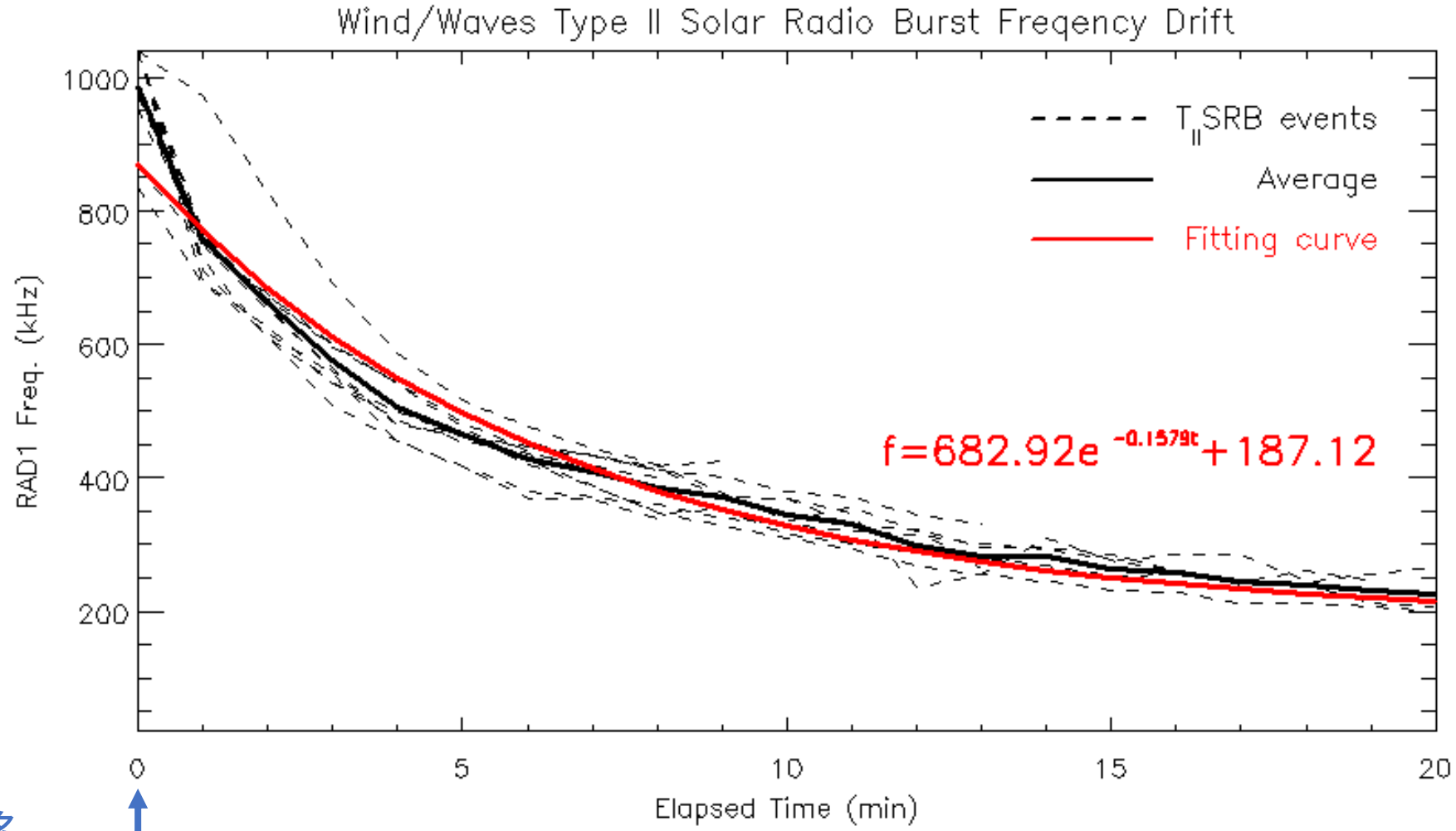
方法


Wind/WAVES
RAD2 Freq. (Hz)
RAD1 Freq. (Hz)
起始
結束
頻漂中心
UT (hh:mm)
2019/04/02
Wind/Waves Gaussian Fitting
2019/04/02 15:50
Wind/Waves Data
Gaussian fitting
局部最大値
Power log10 (V²/kHz)
RAD1 Freq. (Hz)

Wind/WAVES Type II Solar Radio Burst



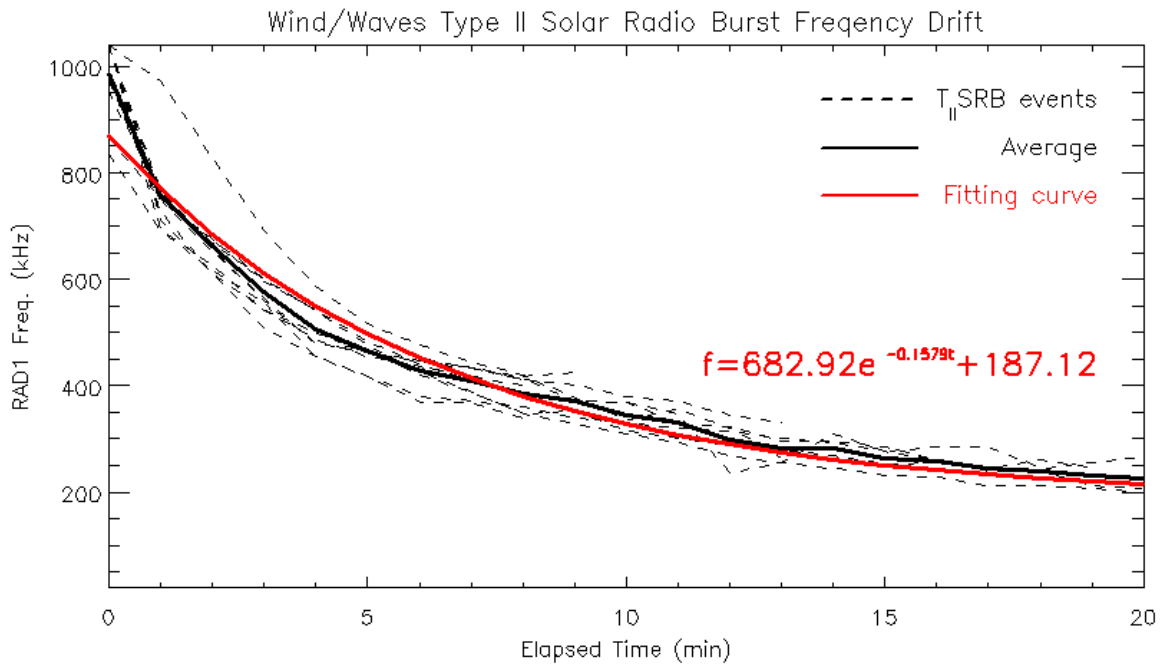
結果


Wind/Waves Type II Solar Radio Burst Freqency Drift
1000
800
600
400
200
RAD1 Freq. (kHz)
0
5
10
15
20
Elapsed Time (min)
T_IISRB events
Average
Fitting curve
f=682.92e^-0.1579t+187.12

起始漂移

結論

1. 頻漂軌跡可用指數函數做近似
2. 高頻頻漂較快，低頻頻漂較慢
3. 頻漂時間越長，頻漂幅度越大
4. RAD1頻段的TIISRB頻漂有最小極限



參考文獻

Pulupa, Marc, et al. “Statistics and polarization of type III radio bursts observed in the inner heliosphere.” The Astrophysical Journal Supplement Series 246.2 (2020): 49.

https://iopscience.iop.org/article/10.3847/1538-4365/ab5dc0

Aguilar-Rodriguez, E., N. Gopalswamy, R. J. MacDowall, and M.L. Kaiser, A study of the drift rate of type II bursts at differentwavelengths, Solar wind 11, in press, 2005.

http://articles.adsabs.harvard.edu/pdf/2005ESASP.592..393A

Gopalswamy, N., et al. "Near-Sun and near-Earth manifestations of solar eruptions." Journal of Geophysical Research: Space Physics 106.A11 (2001): 25261-25277.

https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1029/2000JA004025

感謝聆聽

提　問　時　間