High Energy Solar Physics data in Europe

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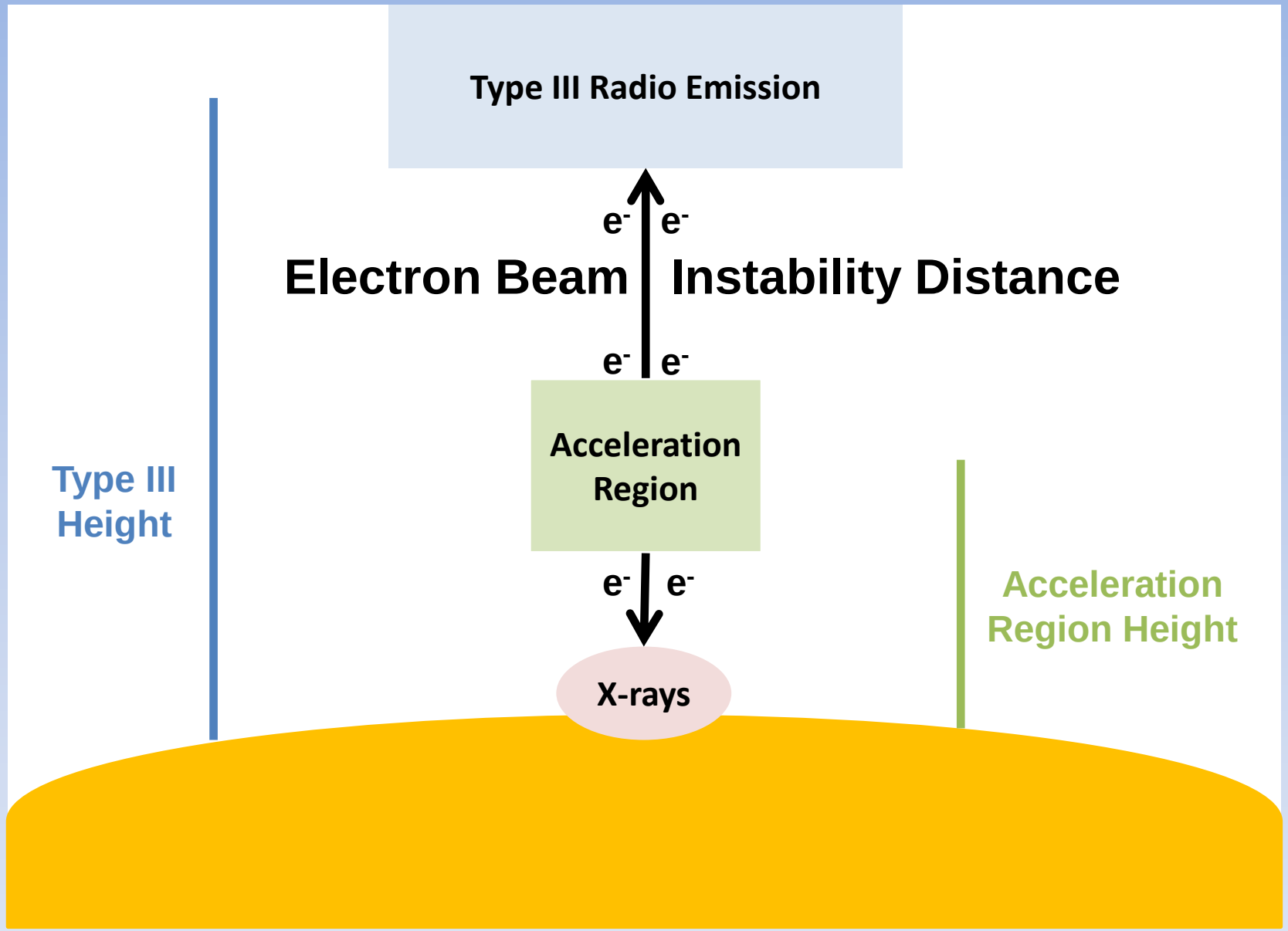
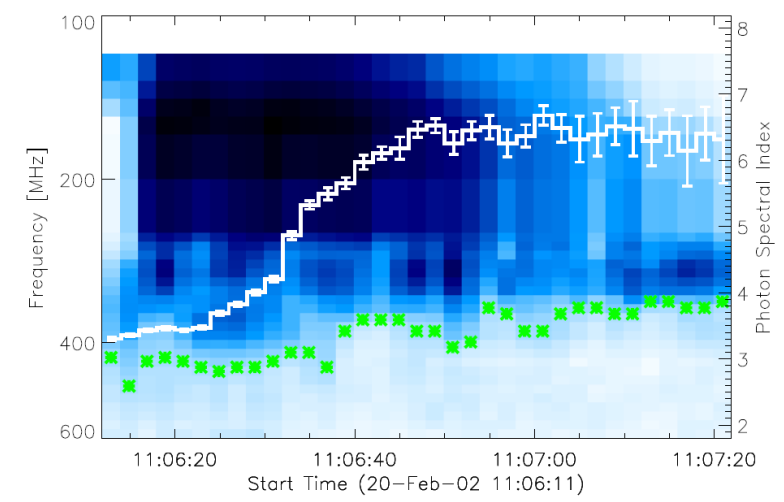

Type III Radio Emission
e- e-
Electron Beam
Instability Distance
e- e-
Acceleration Region
e- e-
X-rays
Type III Height
Acceleration Region Height

X-ray and Radio Study for Spatial Acceleration Region Parameters

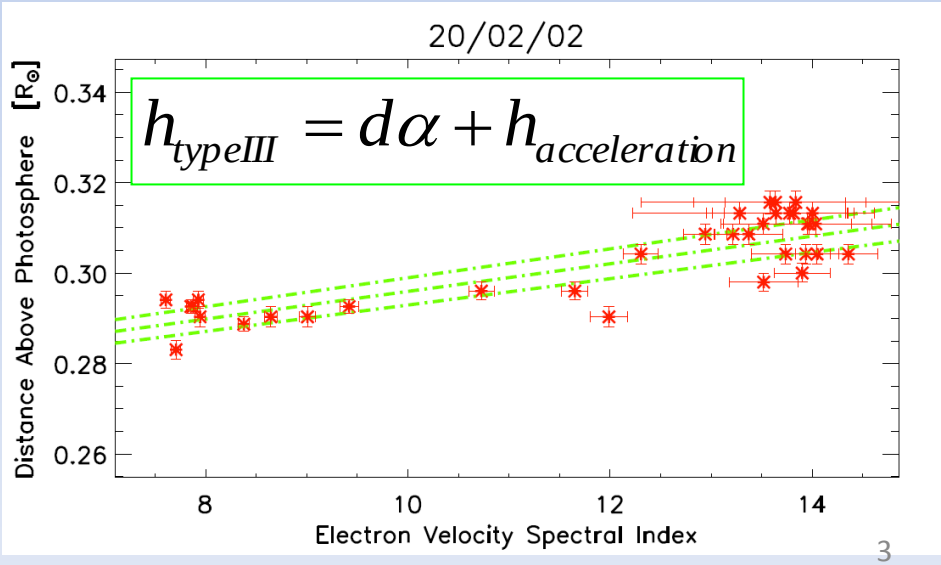
Background is the radio dynamic spectrum for the type III burst for the five best correlated events. The resolution has been reduced to 2 s to fit with RHESSI.



Green stars are the starting frequency – the highest frequency of the type III burst above a certain threshold

White line is the spectral index of the X-ray photons found from a thermal and power-law fit to the data.

We use the intercept and gradient from a linear fit to the data to obtain an estimate on h_acc and d respectively.



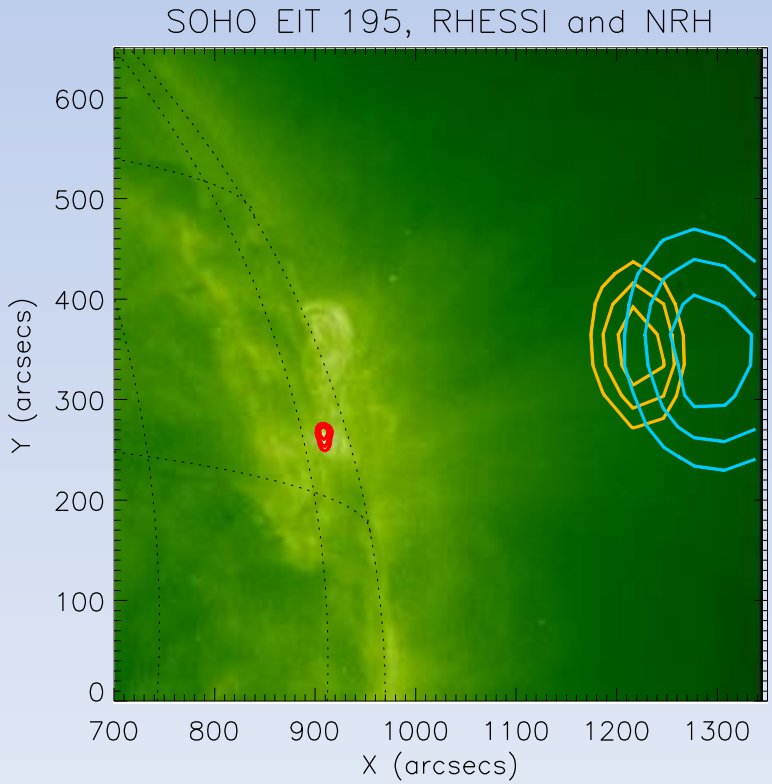
X-ray and Radio Study for Spatial Acceleration Region Parameters

Date	h_{acc} [Mm]	h_{acc} error [Mm]	d [Mm]	d error [Mm]
20/02/02	185	1.1	2.1	0.10
19/07/02	113	12	7.7	1.2
10/03/03	76	9.6	10.8	1.0
18/03/02	45	5.8	11.7	0.57
12/06/03	78	3.9	7.5	0.34
25/07/04	99	6.3	8.4	0.63

Height and size of all the events are well constrained but are dependent upon the assumptions.

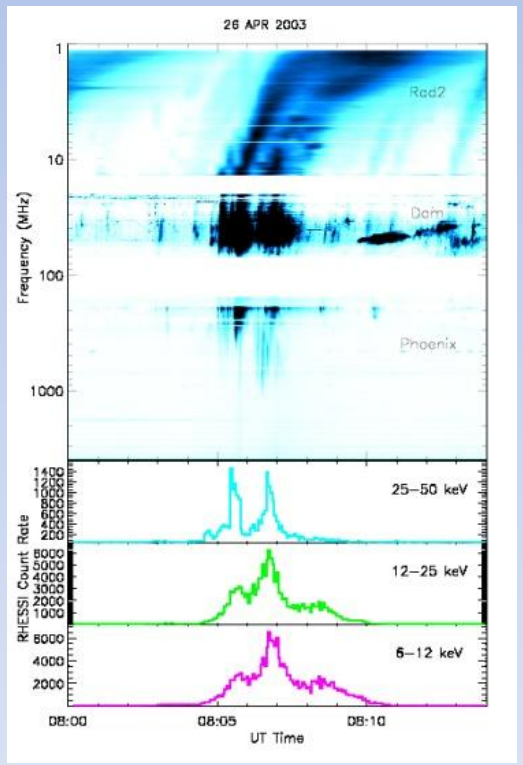
We find that the accelerated particles must start quite high in the corona to be consistent with the high altitude of the type III radio emission.

We find that the longitudinal extent of the acceleration region has to be large to explain the difference in starting height of the radio emission.



Statistical Study of Type III bursts and HXR flares

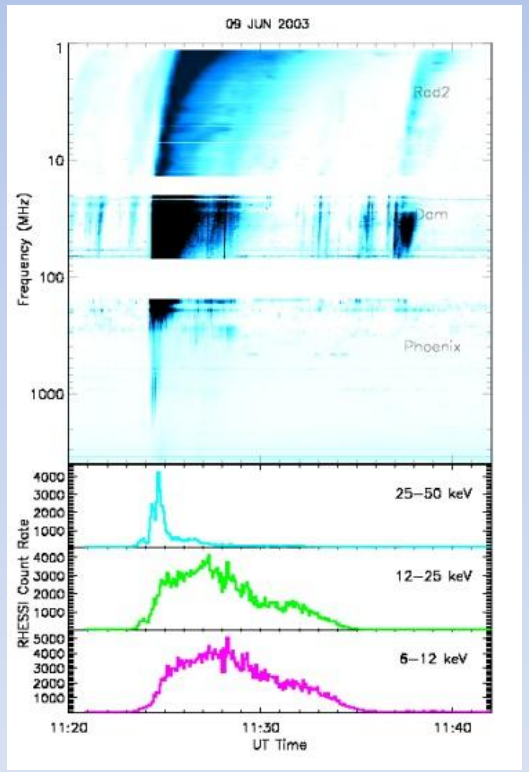
Created a catalogue of simultaneous high frequency type III bursts (Phoenix 2, Nancay Radioheliograph) and X-ray flares (RHESSI) spanning 2002 – 2007. Over 200 flares. Plan to extend the catalogue for this current solar cycle (2012).



Analysing the spectral characteristics (with DAM, WIND/WAVES) of the emission to diagnose statistical trends (e.g. beam properties).

We find that over half the events have emission at the high and low frequencies in radio.

Bursts are generally related to the impulsive X-ray phase.

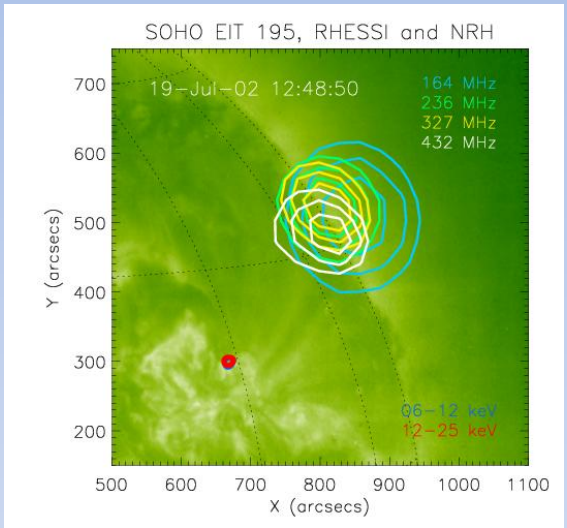


l'Observatoire de Paris — LESIA

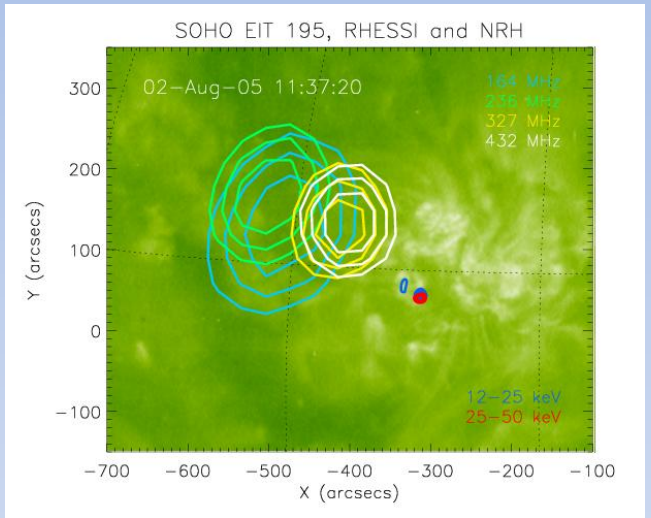
HESPE

Statistical Study of Type III bursts and HXR flares

Investigating the morphology of the events with respect to both the X-ray footpoint emission and the radio at a variety of different frequencies.



Analyse the change in size as a function of frequency to diagnose the local magnetic environment.



Many events show a change in the radio position over time as the coverage in frequency space and X-ray energy changes.

Analytical Relation

Initial Electron Beam $f_0(v,r,t=0) \propto v^{-\alpha} \exp\left(\frac{-|r|}{d}\right)$

Beam generates Langmuir waves when its growth rate is larger than the background plasma collisional absorption. $\frac{\partial f}{\partial v}$

At instability distance
$\Delta r = h_{typeIII} - h_{acceleration}$.

$$\Delta r = d\left(\alpha + \frac{\nu_c n}{\pi \omega_{pe}} v g_0(v)^{-1}\right)$$

Very Small

$$h_{typeIII} = d\alpha + h_{acceleration}$$

Electron Beam Propagation in the Heliosphere