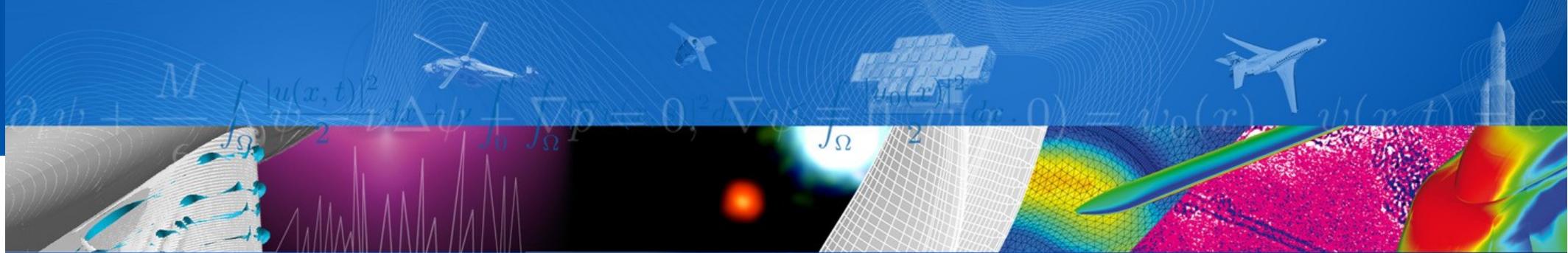


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Radio signature of the Jovian magnetosphere dynamics and interaction with the solar wind

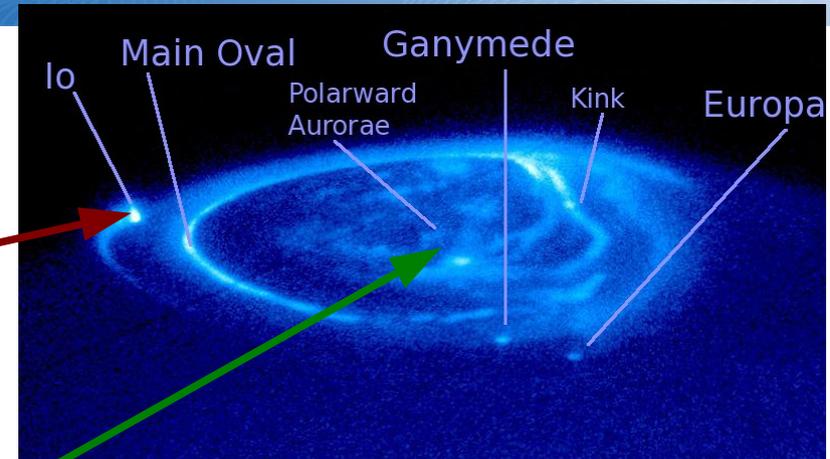
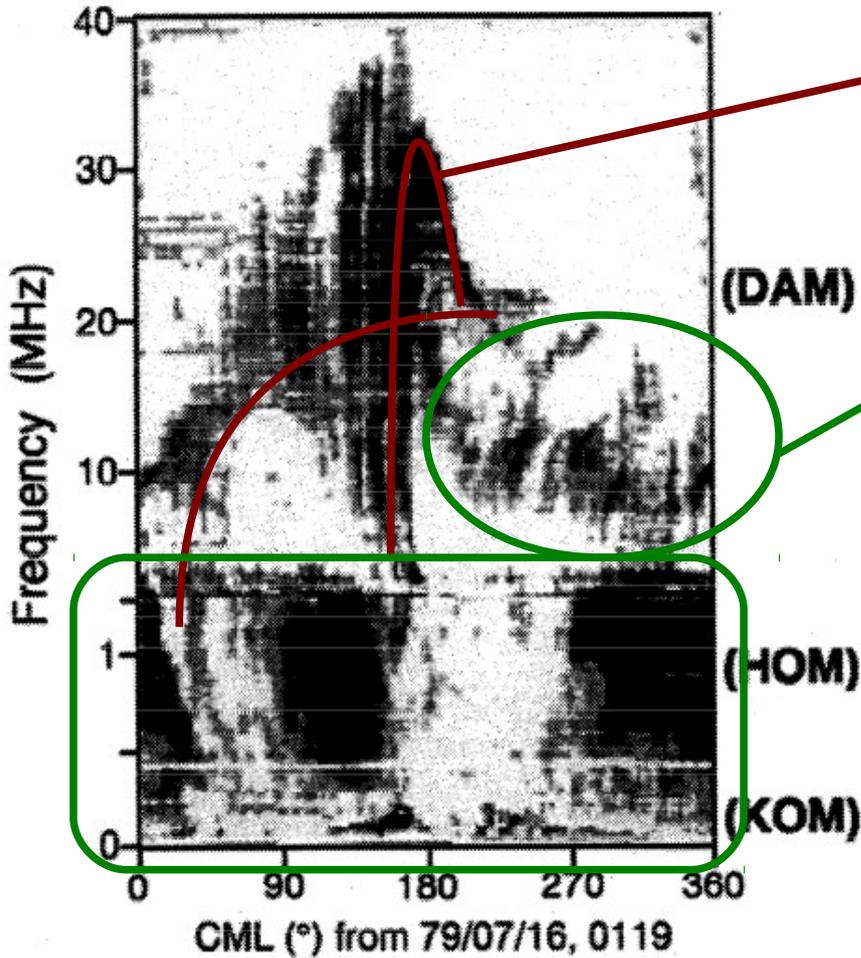
S. Hess

P. Zarka (LESIA), E. Echer (INPE), L. Lamy (LESIA)
P. Louarn (IRAP)



retour sur innovation

Voyager 2 @ Jupiter



Non-Io related emissions are still mostly unexplored.

No clear localization.

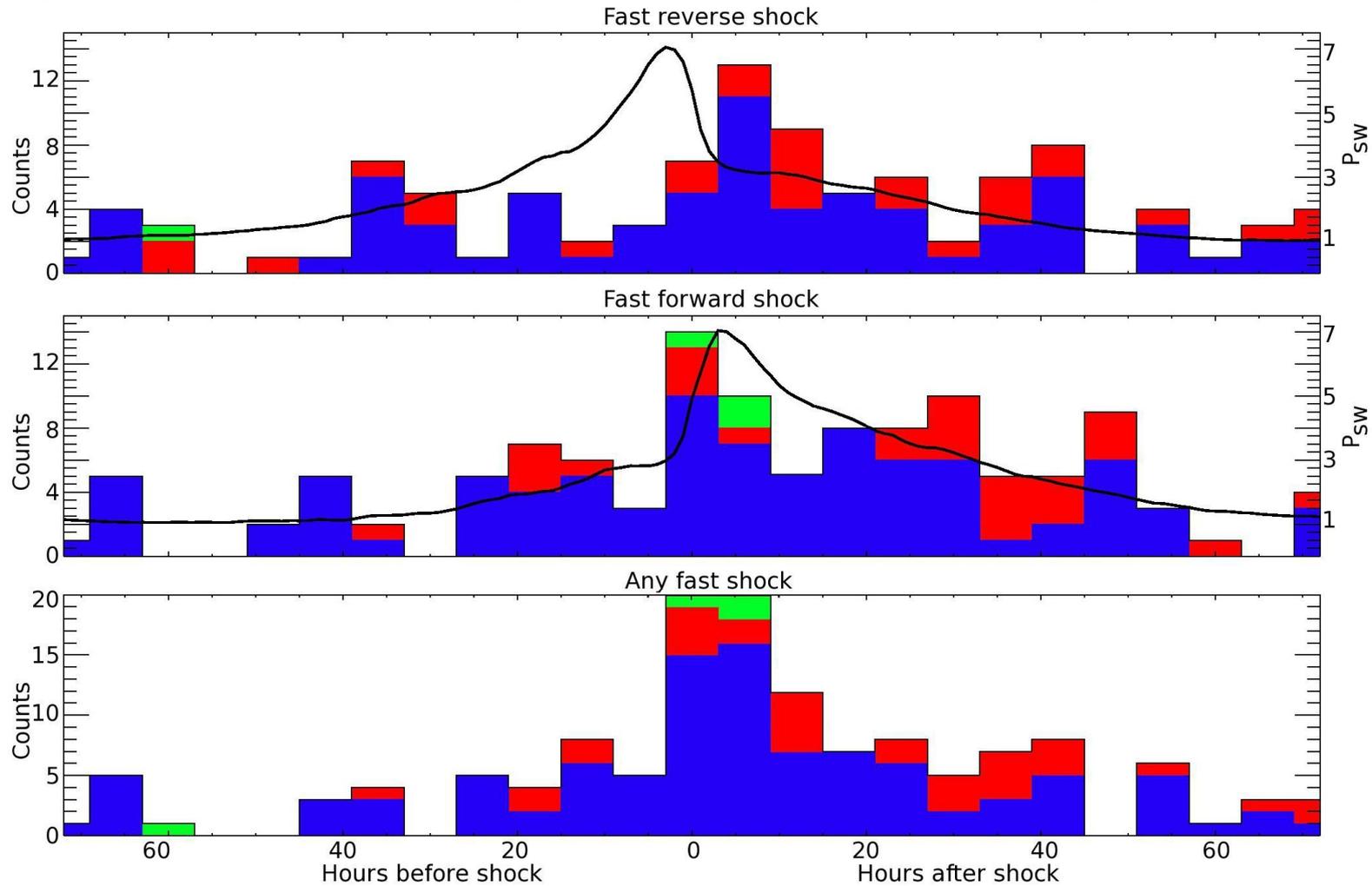
Dawn-dusk asymmetry

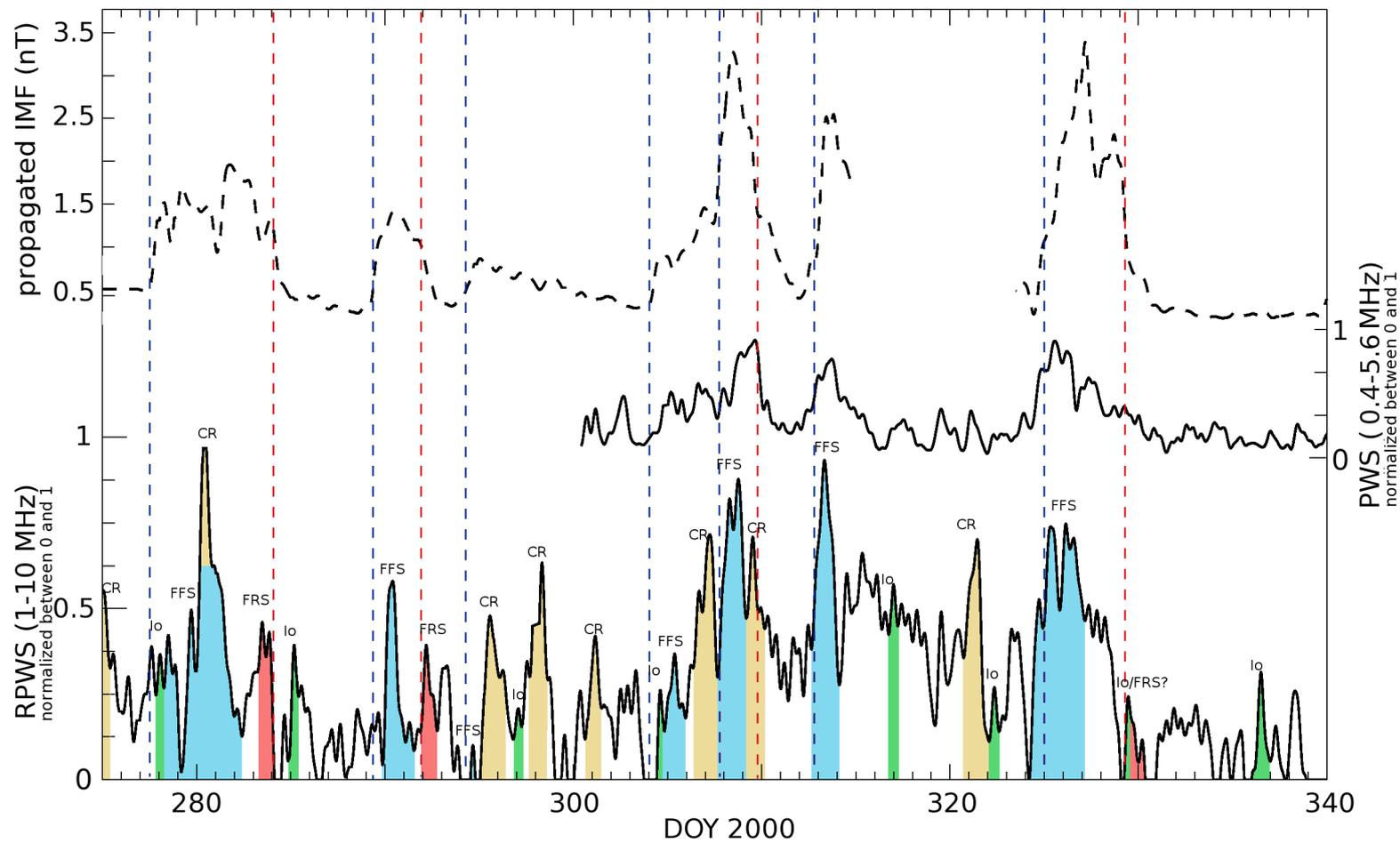
Intensity and occurrence controlled by Solar wind pressure.

⇒ Due to the solar wind interaction with magnetosphere (hardly known itself)

Correlation Jovian emissions- solar wind ?

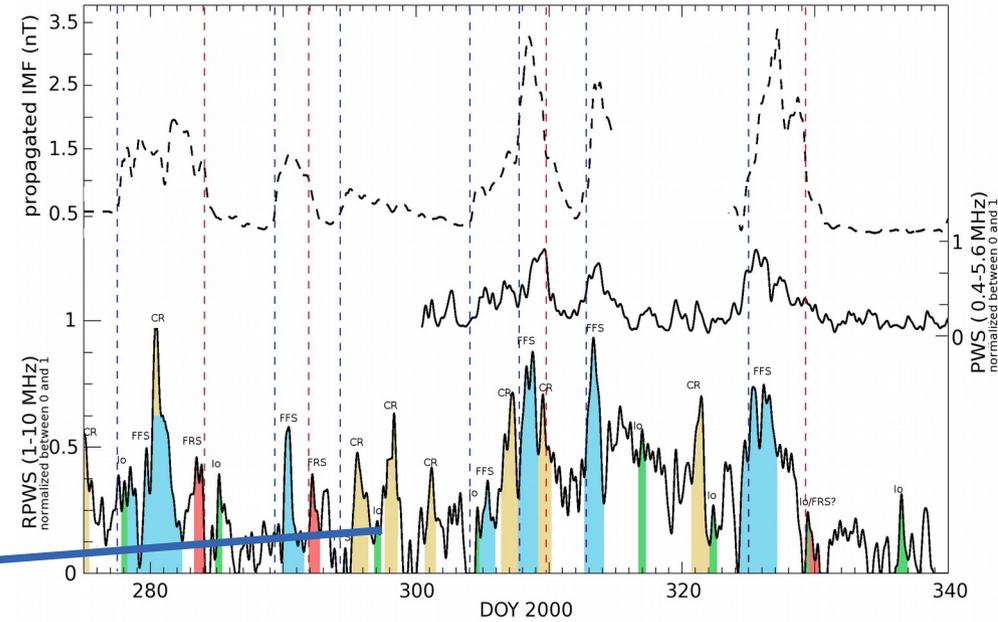
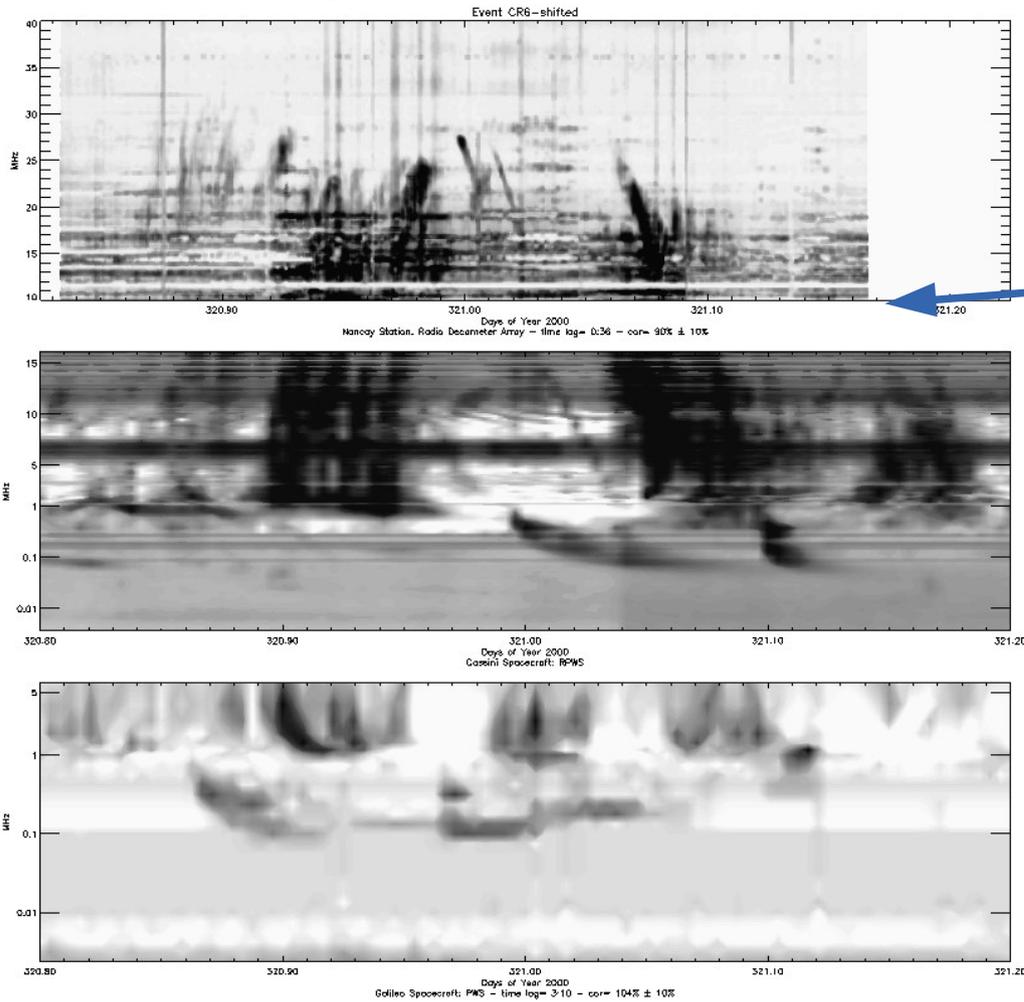
Nançay observations + propagated solar wind => shock triggered emissions ?





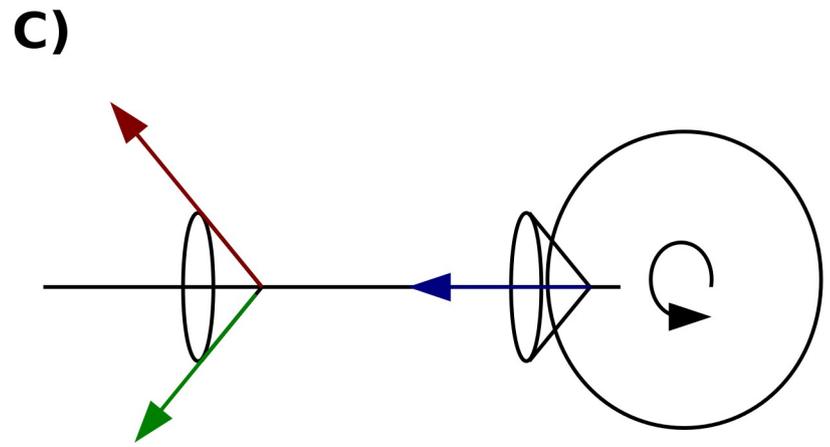
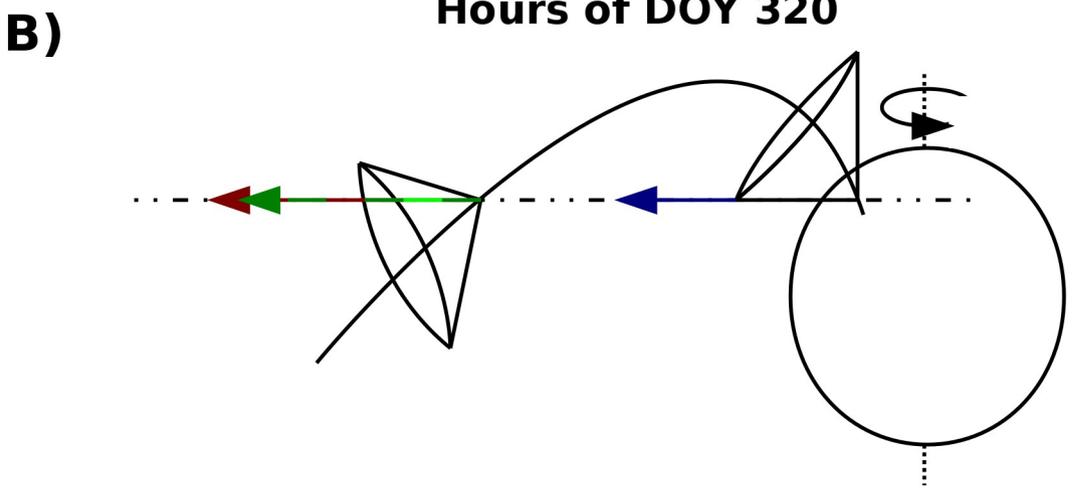
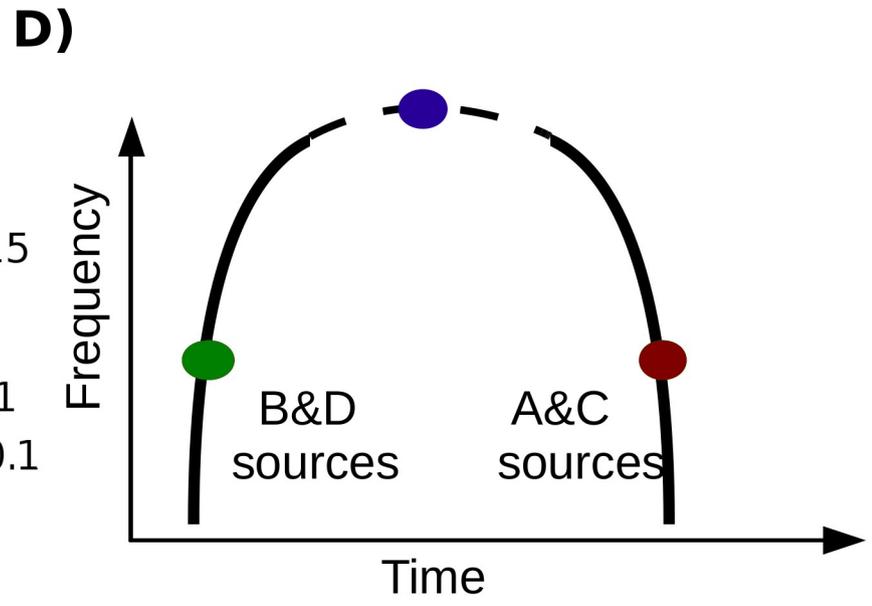
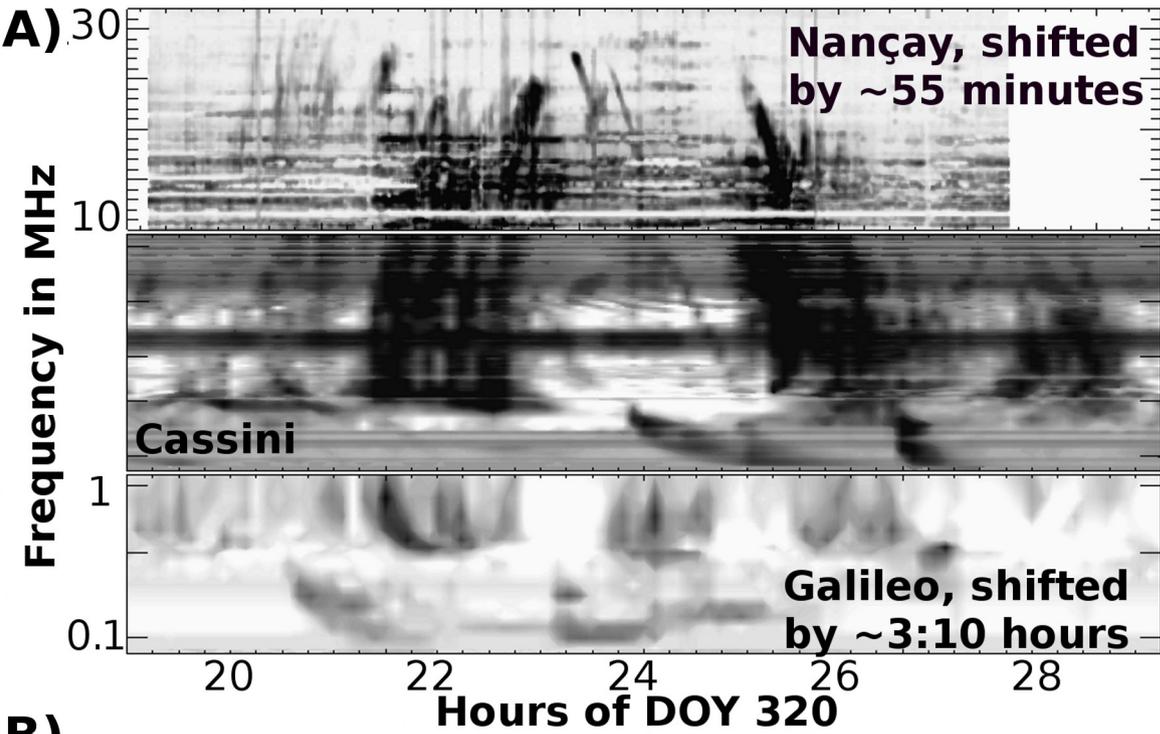
Correlation Jovian emissions - solar wind ?

Cassini + Nançay + Galileo observations :



Intense corotating radio source.

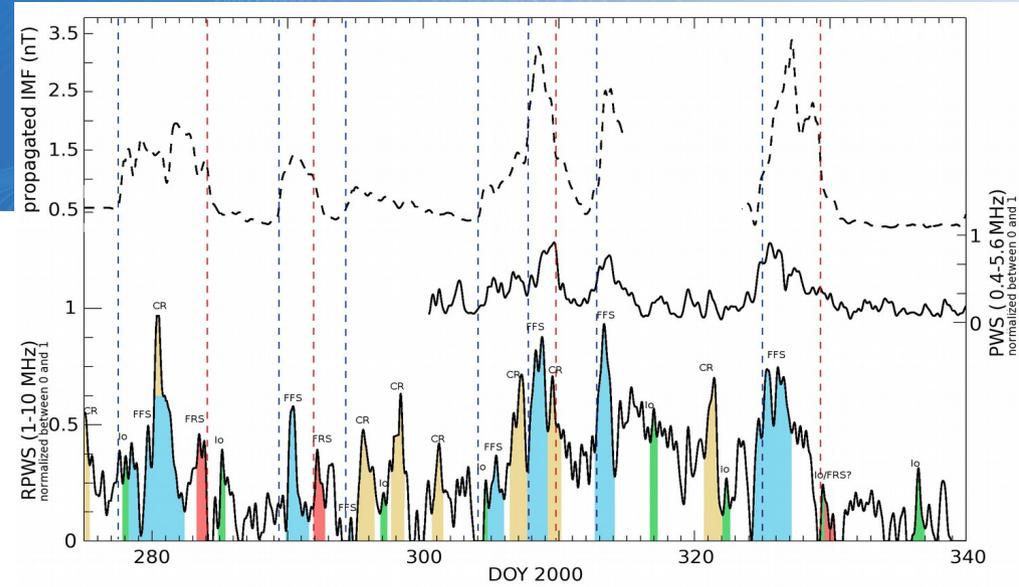
Does not seem to be related to shocks in the dataset, but seen more intense when there are shocks by Laurent.



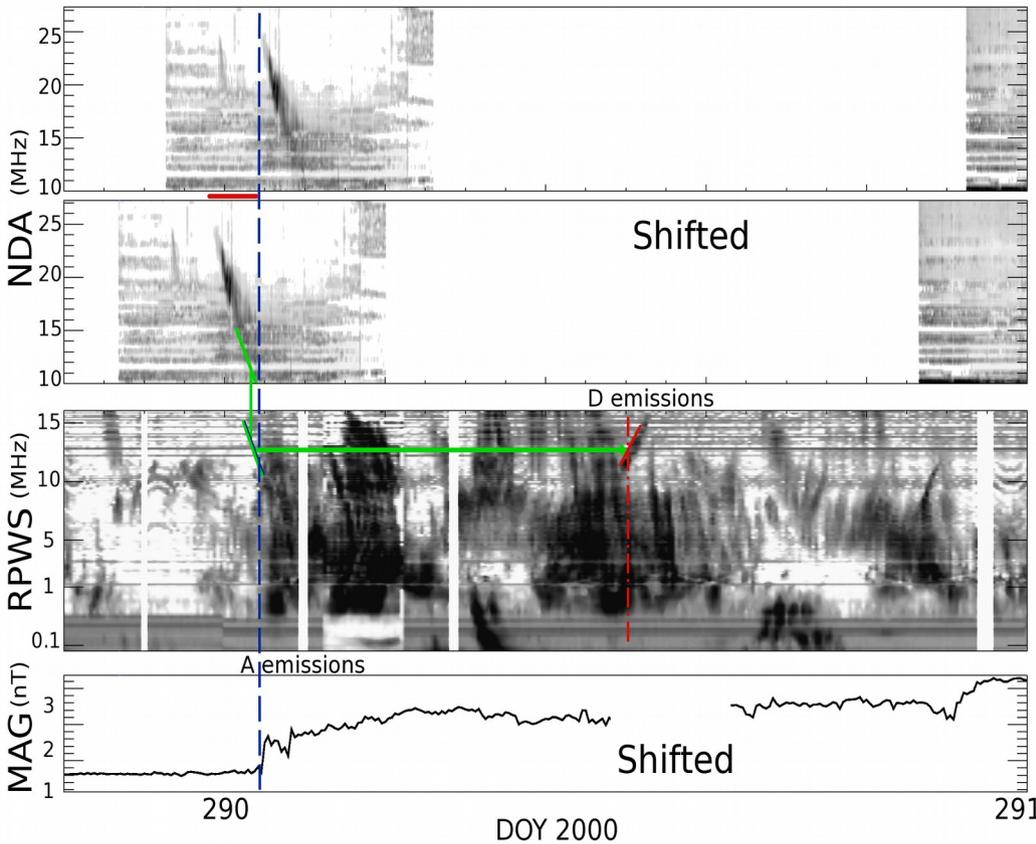
Forward shocks:

D'abord emission coté soir

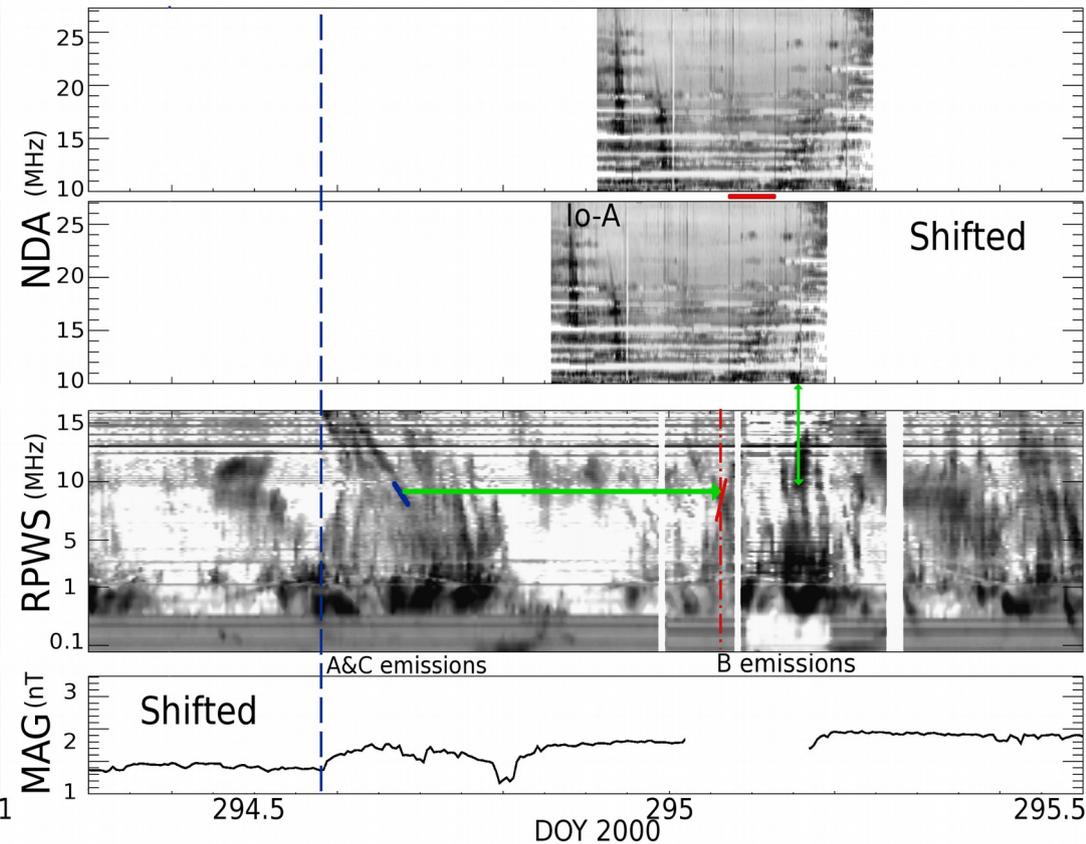
Puis (mais pas toujours) émissions coté matin



DOY 290 event

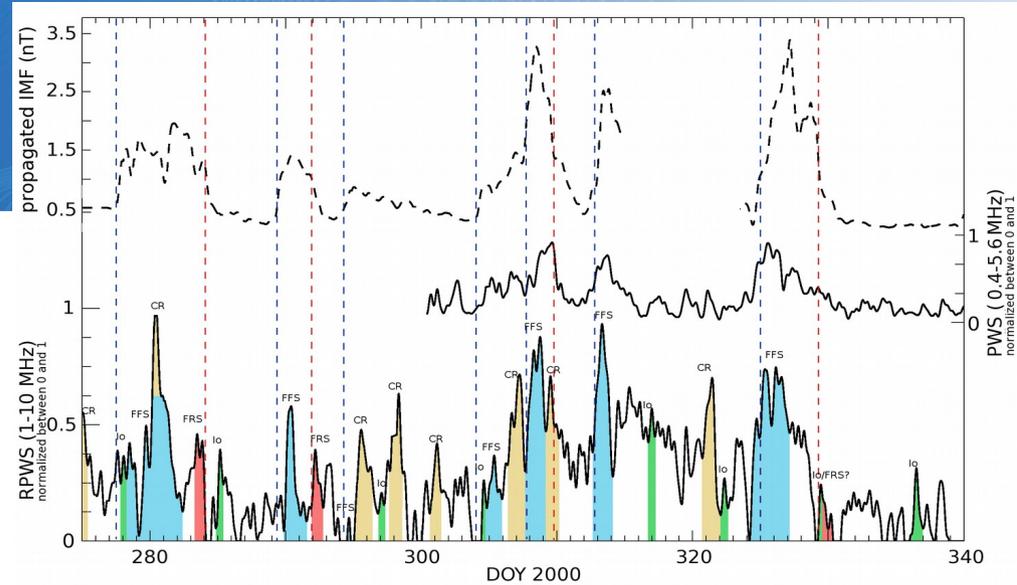


DOY 294 event

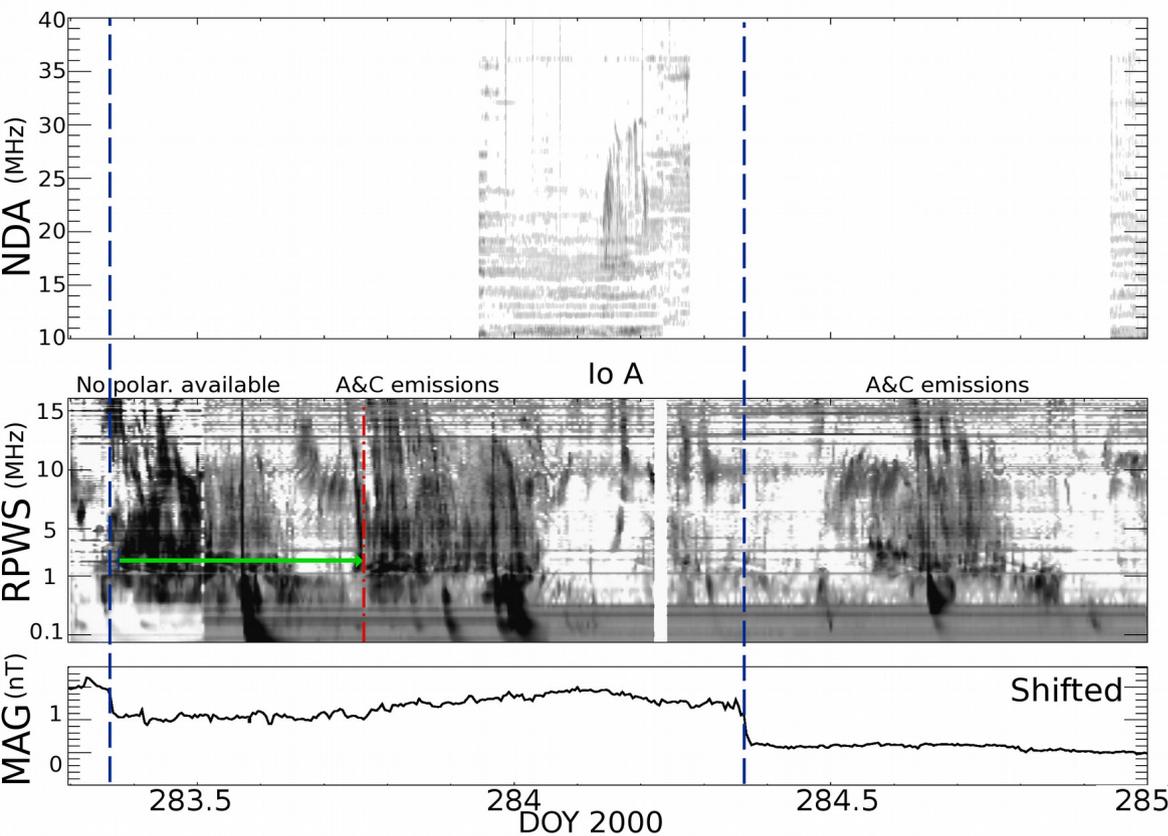


Reverse shocks:

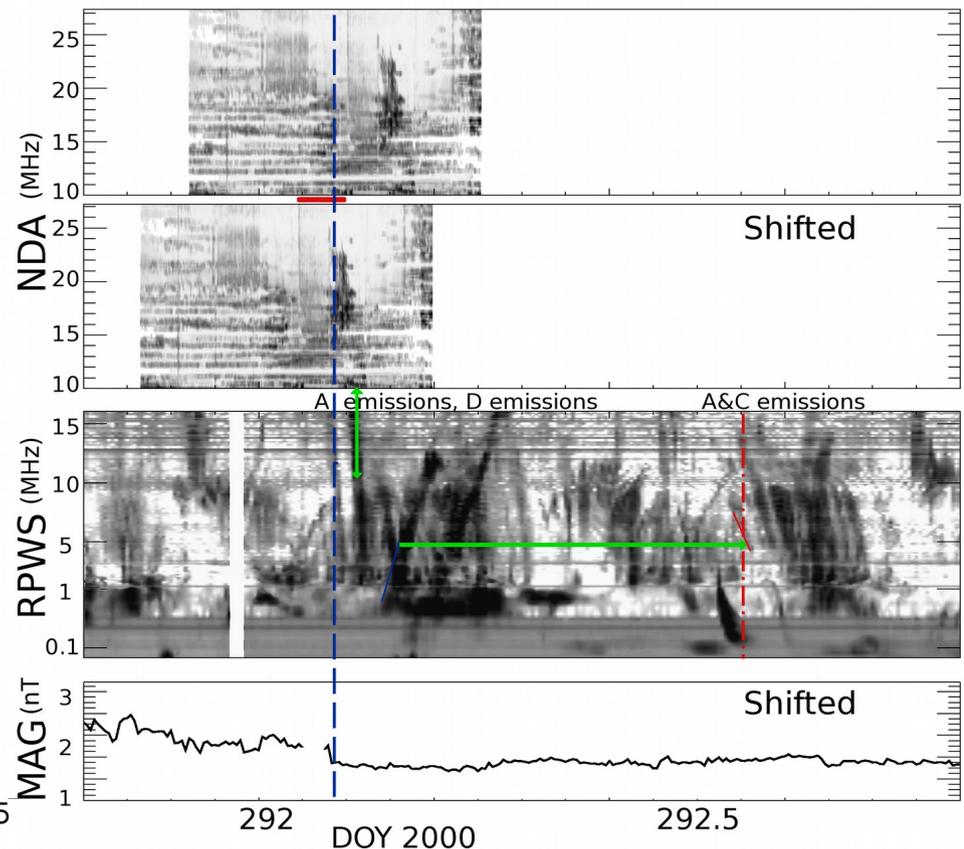
Emission cotés matin et soir en même temps

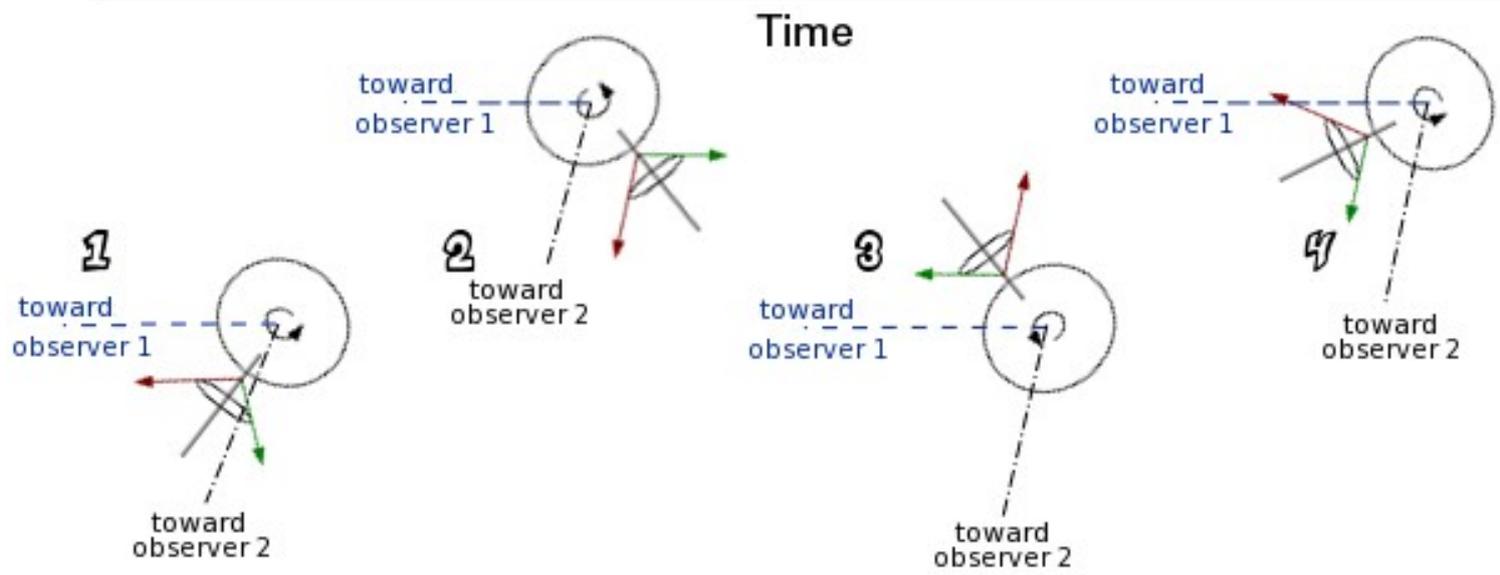
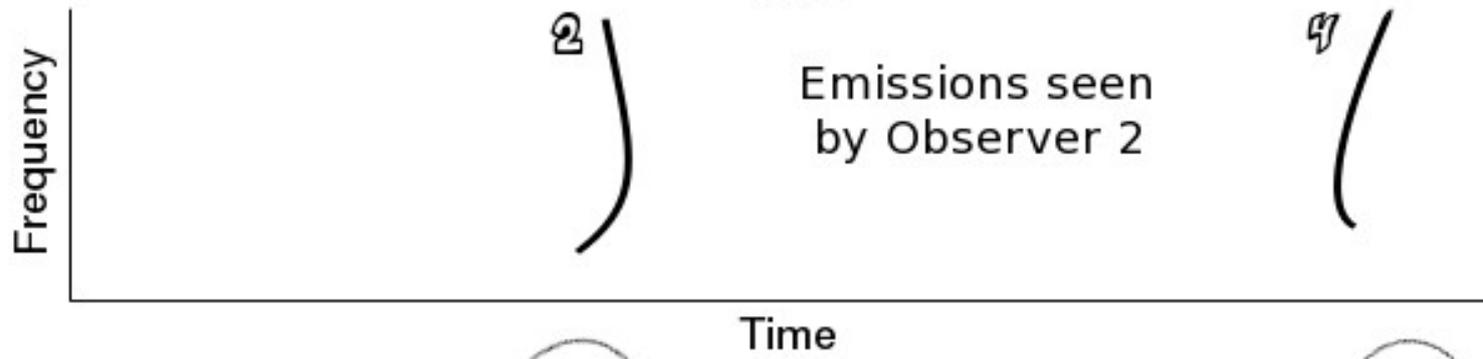
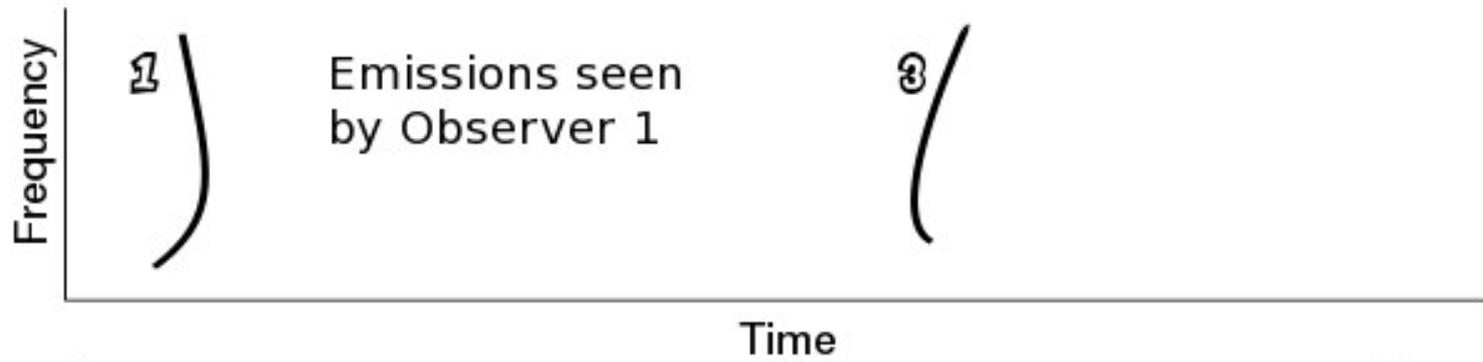


DOY 283 event



DOY 292 event





Application :

Measurements of :

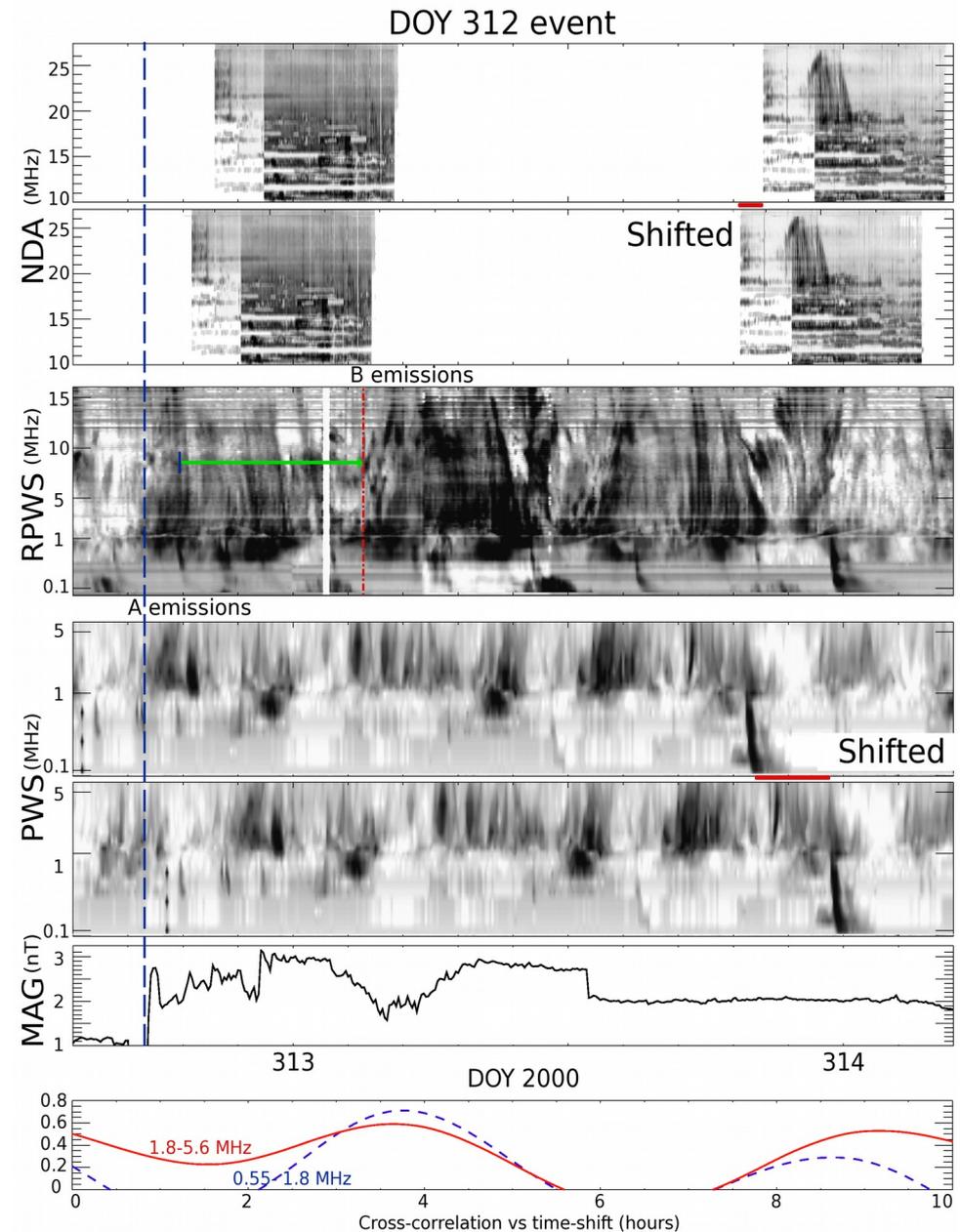
The delay between the observation of a shock by Cassini's MAG and the onset of the radio emission

=> constrains the SW velocity and the magnetospheric response delay

Delay between observations from different observers.

Delay between vertex-late and vertex-early arcs.

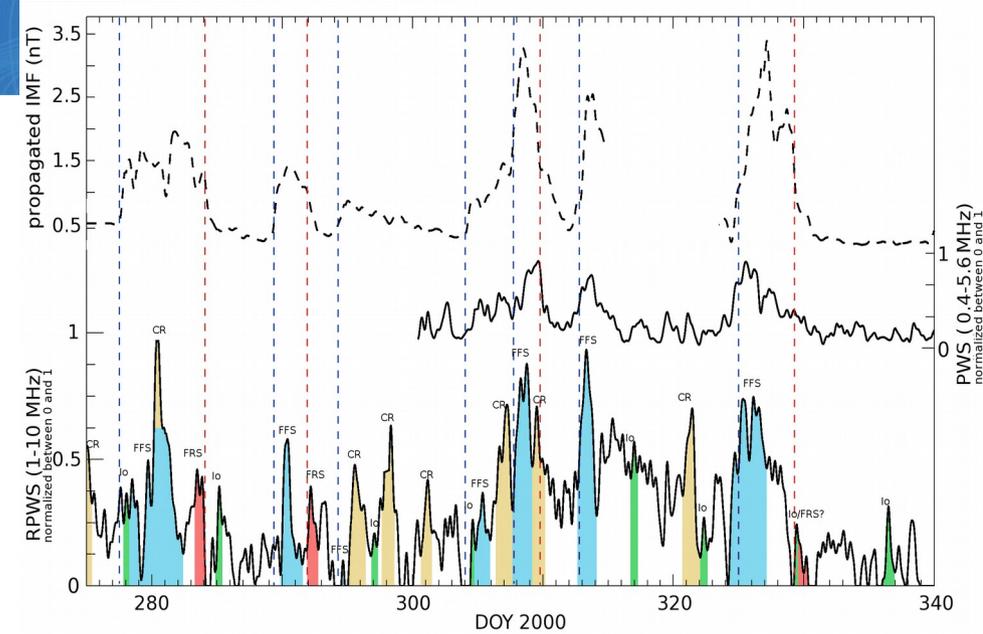
=> gives the corotation rate of the source



Distribution des taux de corotation bimodale

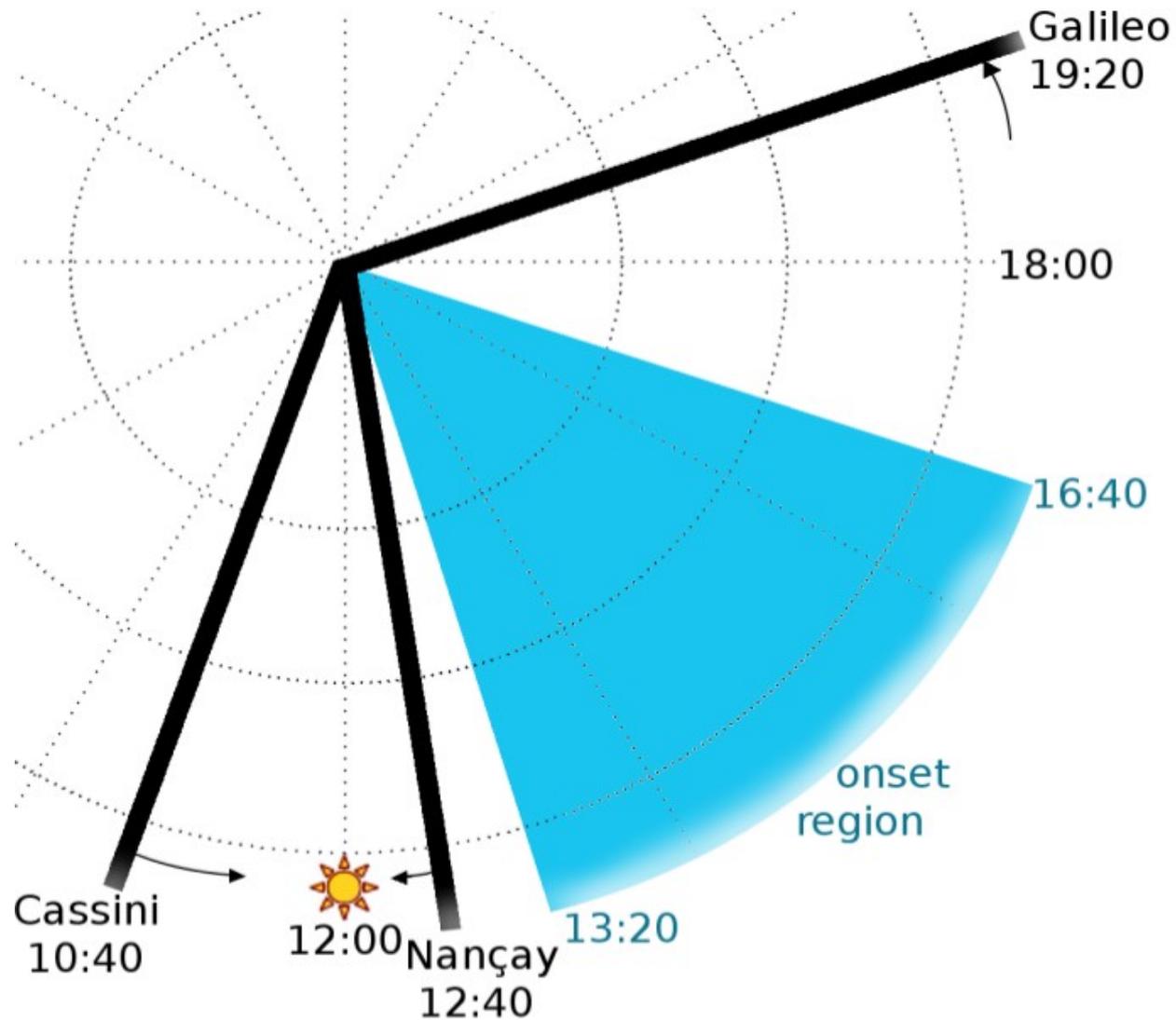
→ Lien avec la taille de la magnétosphère?

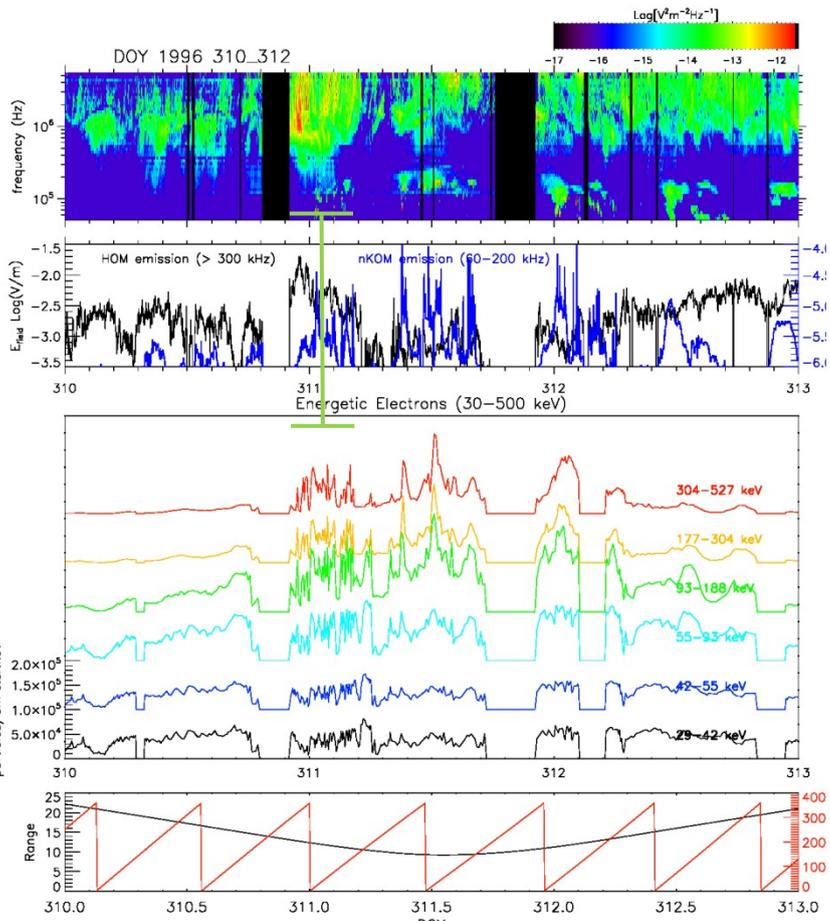
Cohérent avec les modèles de magnétosphère



Date, FFS detection	B_{before} (nT)	B_{after} (nT)	r_B	Date, radio observation	v_{SW} (km.s ⁻¹)	Δt (hours)	$\Omega_{Dusk \rightarrow Dawn}$ ±10%	$\Omega_{Cas. \rightarrow Gal.}$ ±10%	$\Omega_{Cas. \rightarrow Nan.}$ ±10%
DOY 275	0.5	1.6	3.1	DOY 278	400-550	20 to 35	37%		
DOY 287	0.35	0.7	2.1	DOY 290	450-500	22 to 30	50%		50%
DOY 292	0.35	0.55	1.6	DOY 294	430-470	13 to 17	55%		55%
DOY 302	0.45	0.9	2	DOY 304	350-450	0 to 20		41%	
DOY 306	1.3	2 ^a	1.5	DOY 308	400-450	0 to 5		78%	80%
DOY 311	1.2	2.6 ^a	2.4	DOY 312	400-500	-10 to -5	74%	87%	85%
DOY 323	0.35	2 ^a	5.7	DOY 324	400-600	-9 to 0	71%	83%	
Date, FRS detection	B_{before} (nT)	B_{after} (nT)	r_B	Date, radio observation	v_{SW} (km.s ⁻¹)	Δt (hours)	$\Omega_{Dawn \rightarrow Dusk}$ ±10%	$\Omega_{Cas. \rightarrow Gal.}$ ±10%	$\Omega_{Cas. \rightarrow Nan.}$ ±10%
DOY 282 +24h	1.55 1.2	1.06 0.6	1.5 2	DOY 283 ?	400-500	4 to 15	46%		
DOY 290	0.4	0.6	1.5	DOY 292	450-500	- 6 to -0	44%		60%
DOY 308	1.6	1.2	1.3	Happened during Corotating event	400-450				
DOY 328	2	0.75	2.7	Happened during Io storm	500-600				

D'après la géométrie des observations, on peut délimité une région où les émissions démarrent

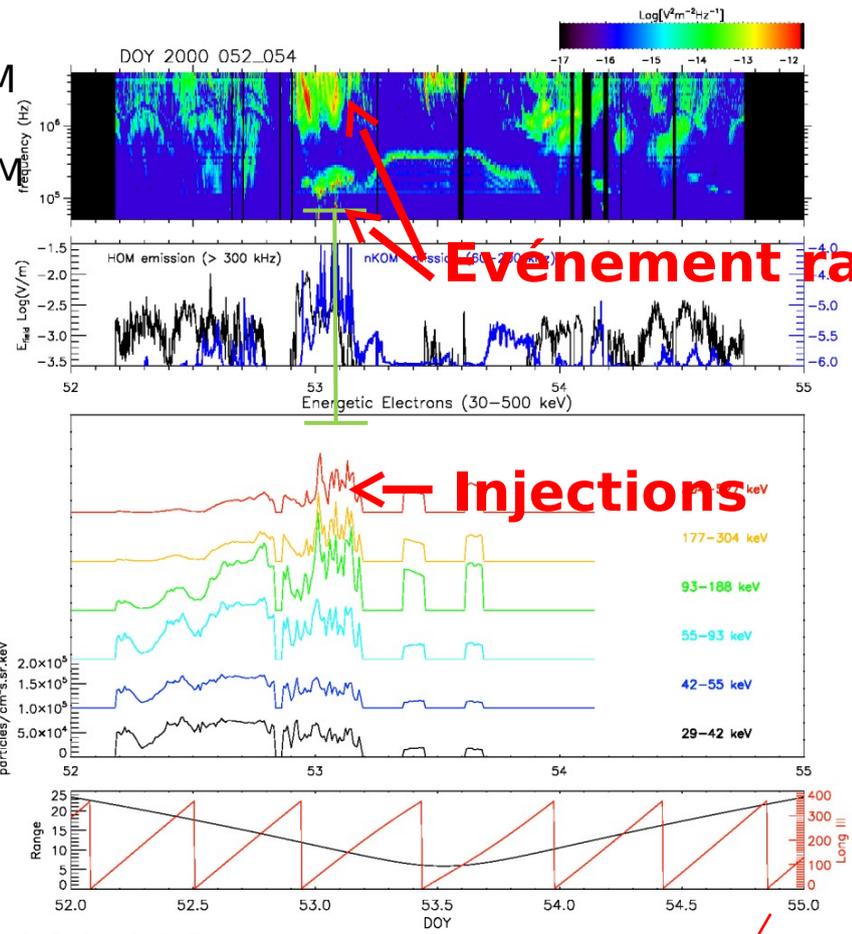




1996-310. Perfect case. Sporadic injections during the event. $R \sim 14$ Rj.

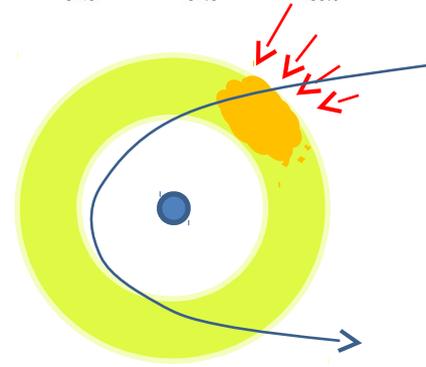
C'est systématique. 35 périjoves, 12 avec évènement vu à moins de 25 Rj. Ils sont TOUS associés à des injections

HOM
nKOM

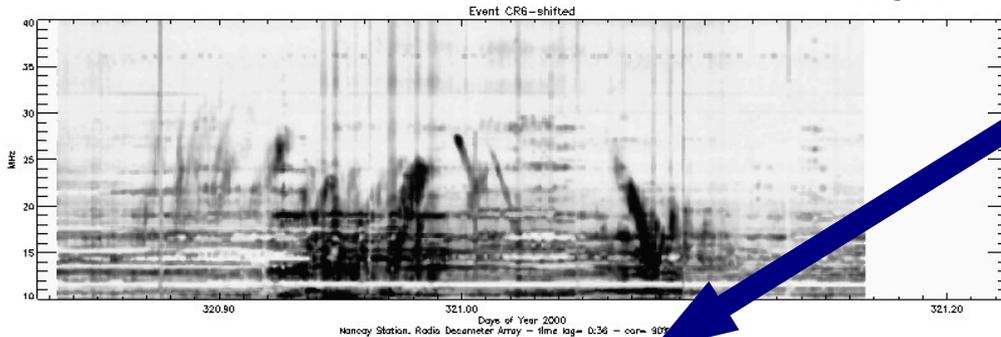


2000-053. Very similar.

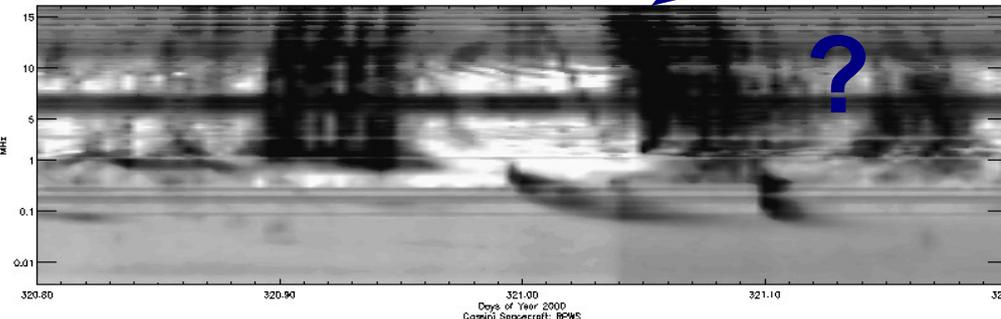
- Sporadic injections. $R \sim 10$ Rj. Galileo goes deep into IO torus, 'inside' of nKOM. $R \sim 7$ Rj



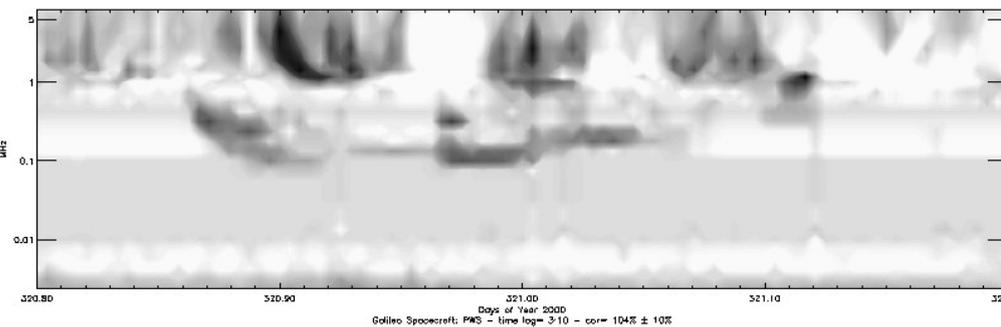
HOM



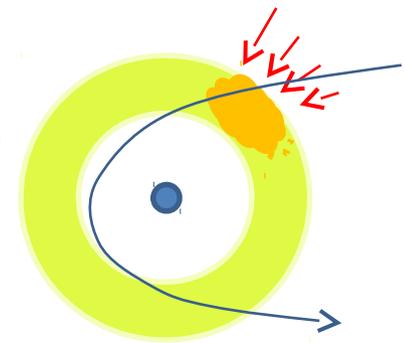
Evénement radio



Injections



053. Very similar. ... radic injections. ... Rj. Galileo goes into IO torus, ... of nKOM. R~7 Rj

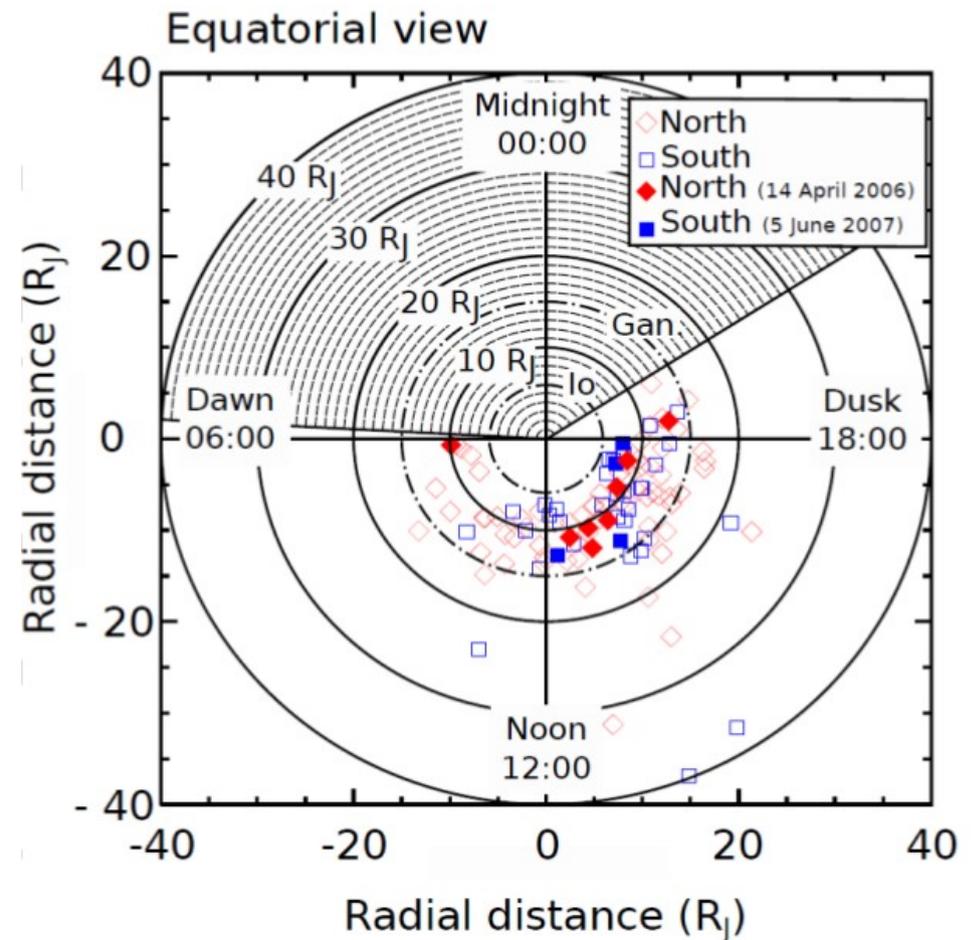
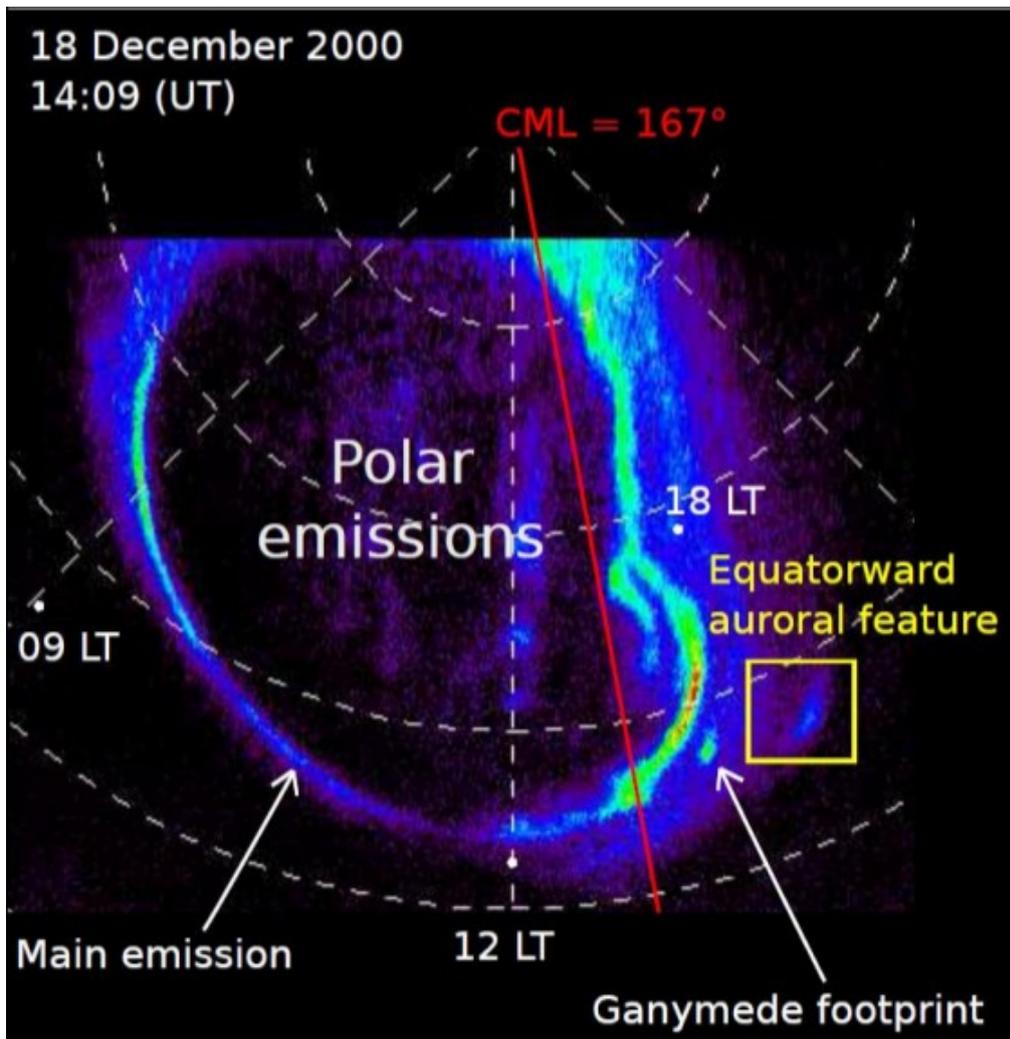


12 avec évènement vu à moins de 25 Rj. Ils sont TOUS associés à des injections

[Louarn, 2014]

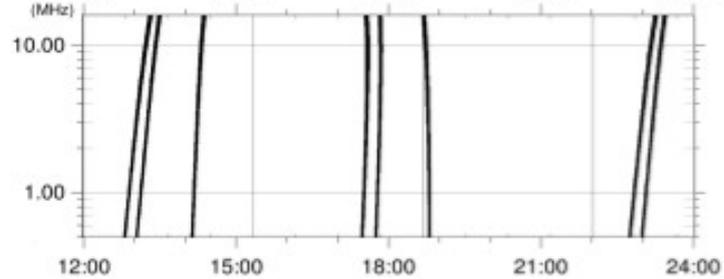
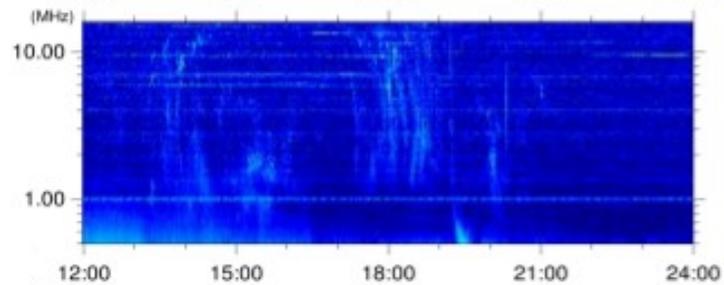
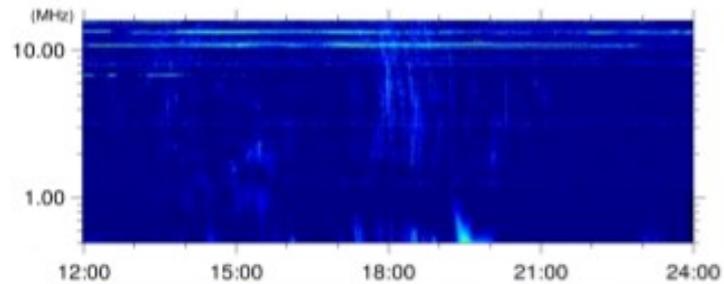
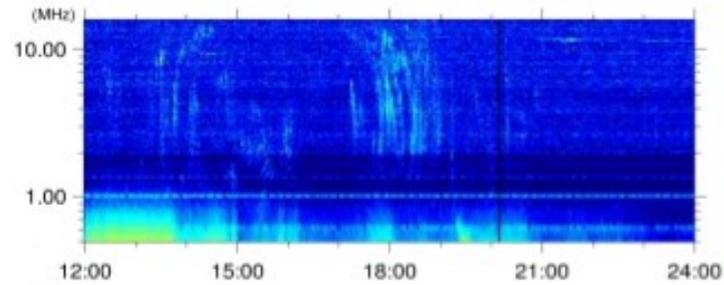
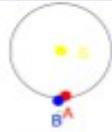
Injections observées en UV

Dumont et a., JGR, sous presse



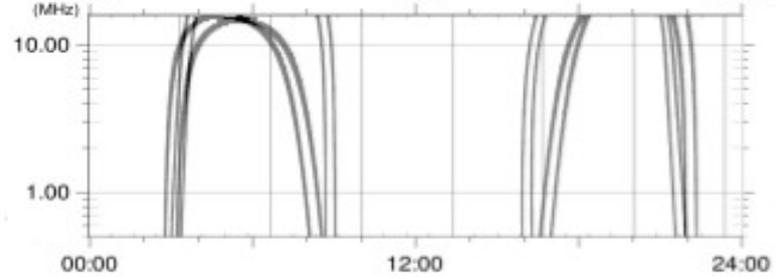
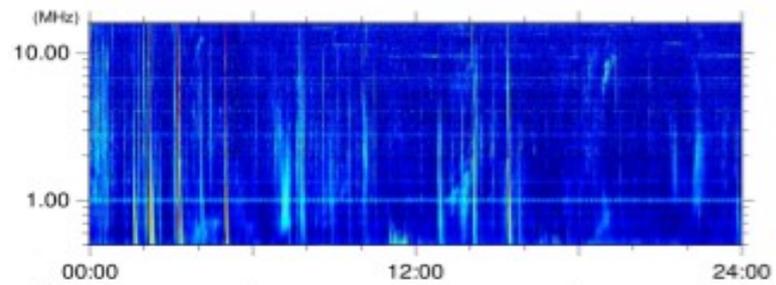
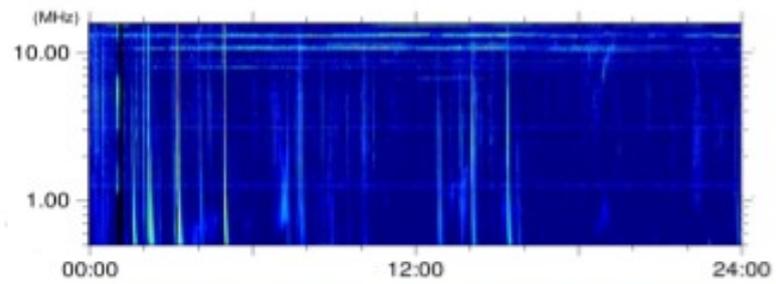
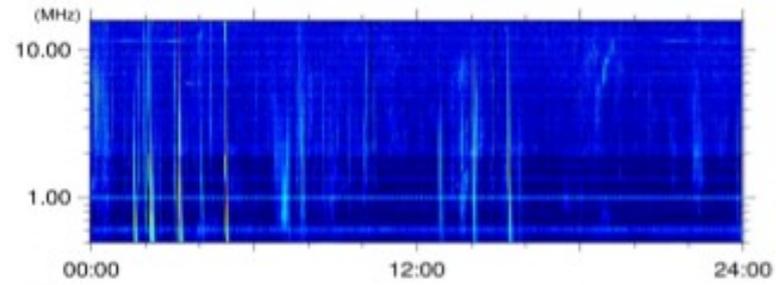
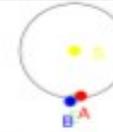
2007-05-18 (138)

stereo/earth separation(deg) a: 5.6, b: 2.8



2007-06-05 (156)

stereo/earth separation(deg) a: 7.2, b: 4.1



Jusqu'ici seules 2 des multiples composantes des émissions radio Joviennes sont identifiées de manière sûre:

Emissions décamétriques de Io (Io-DAM)

Emissions kilométriques du tore de Io (n-KOM) mais modulation à étudier

On a identifié la signature de chocs dans le vent solaire

Côté soir pour les compressions

Côté matin et soir pour les décompressions

La rotation des sources dépend du niveau de compression de la magnétosphère

On a aussi identifié des sources en corotation, peut être liées à des injections et de la reconnection dans la queue