

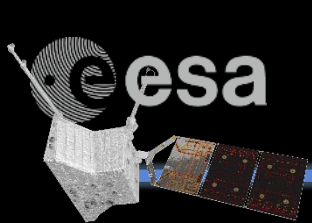
# Current status, initial results, and updated plans of BepiColombo/Mio: interplanetary cruise and planetary flybys

05 May 2020

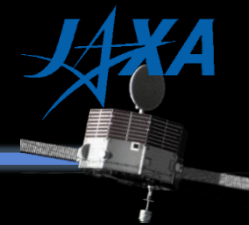
EGU General Assembly 2020 @online

Go Murakami<sup>1</sup>, Johannes Benkhoff<sup>2</sup>, Hajime Hayakawa<sup>1</sup>,  
and BepiColombo Science Working Team

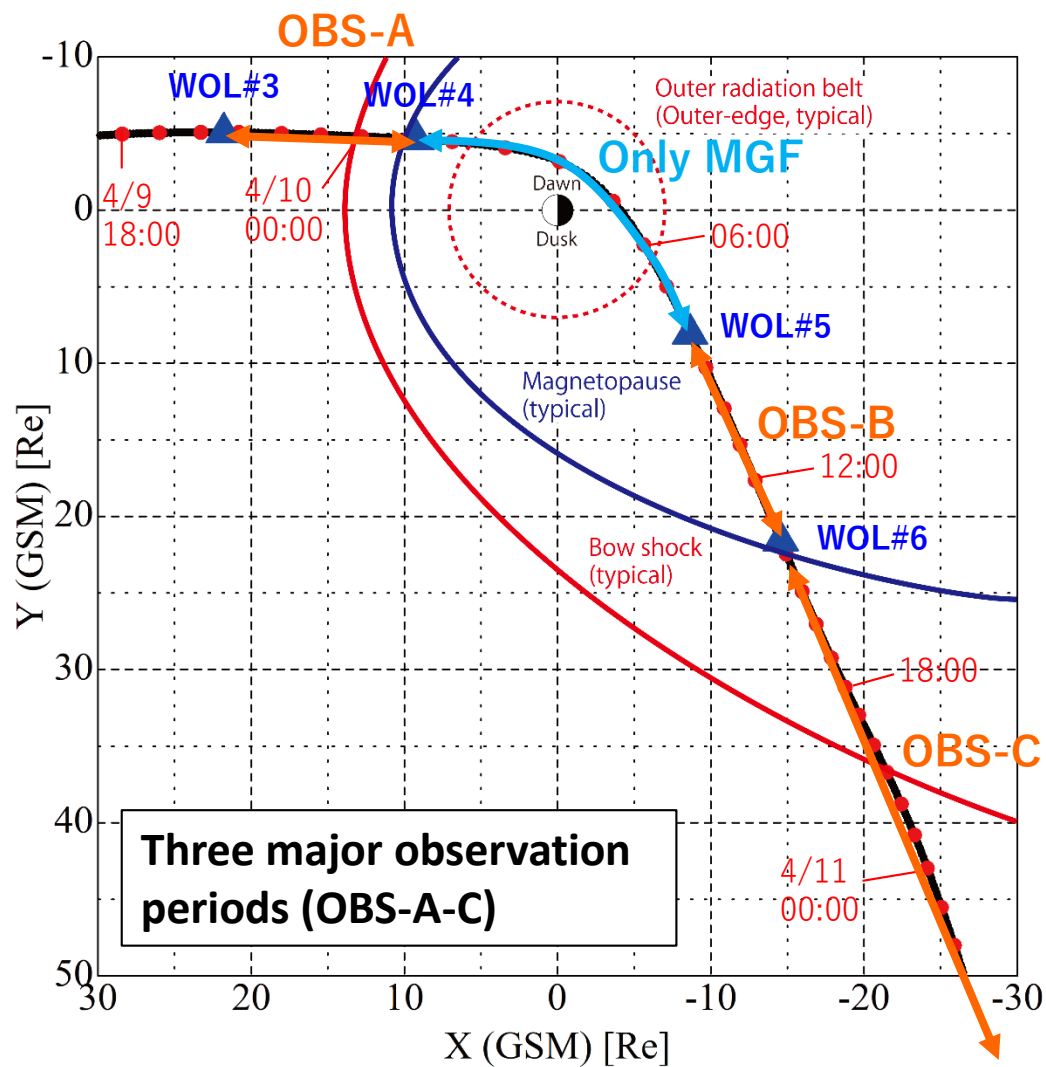
<sup>1</sup>JAXA/ISAS, <sup>2</sup>ESA



# Earth flyby: Mio observation summary

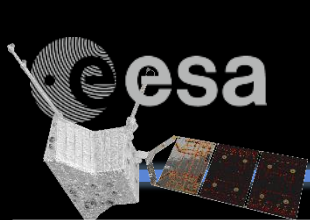


Closest approach: 04:24:57UT on 10 April 2020 (altitude: 12689 km)

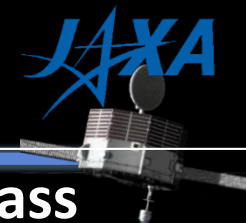


## Plasma particles, magnetic fields, and magnetic waves

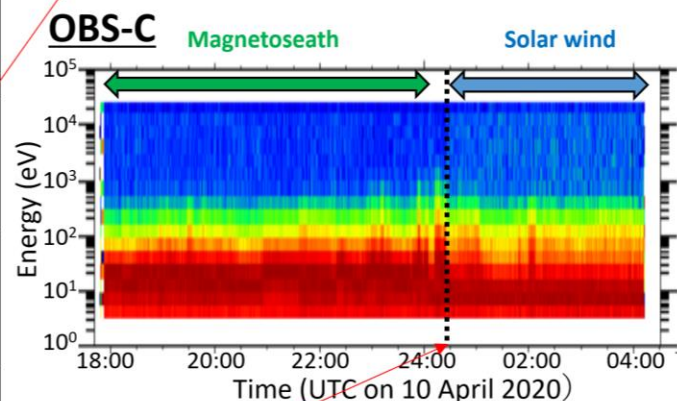
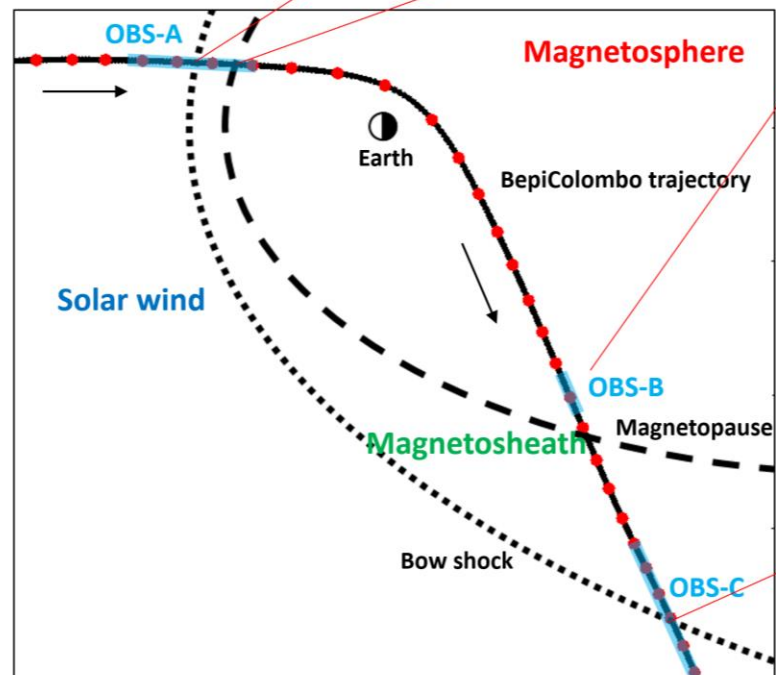
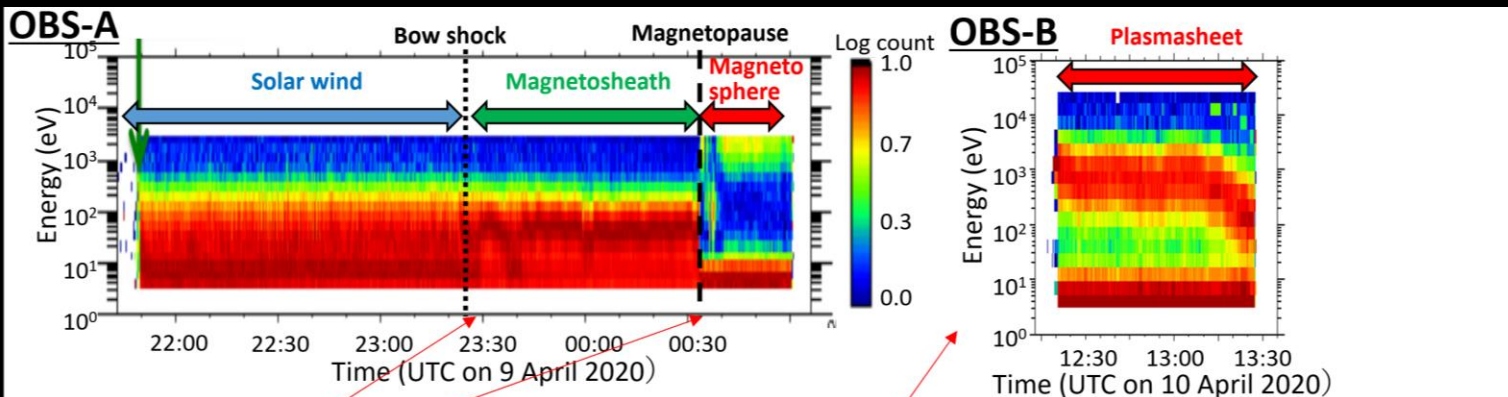
BepiColombo/Mio				
Plasma (SW, MS)	MPPE	MEA	Low-energy electrons	3eV-26keV
		MIA	Low-energy ions	15eV-29keV
		MSA	Ion mass spectroscopy	1eV-38keV
				1-60 amu/e
				m/ Δ m = 40 (<13keV)
				m/ Δ m = 10 (>13keV)
		HEP-ion	High-energy ions	30keV-1.5MeV
		HEP-ele	High-energy electrons	30keV-700keV
		ENA	Plasma imaging	10eV-3.3keV
	MGF	Magnetic field		DC - 64Hz L: <0.25Hz, M: 8Hz
Exosphere	MSASI	Na-exosphere image		Spatial resol.: 3-30km R = 65000
		Dust environment		10s pg*km/s
Dust	MDM			



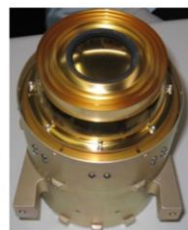
# Earth flyby: initial results (MPPE)



## Low energy electrons (MEA)



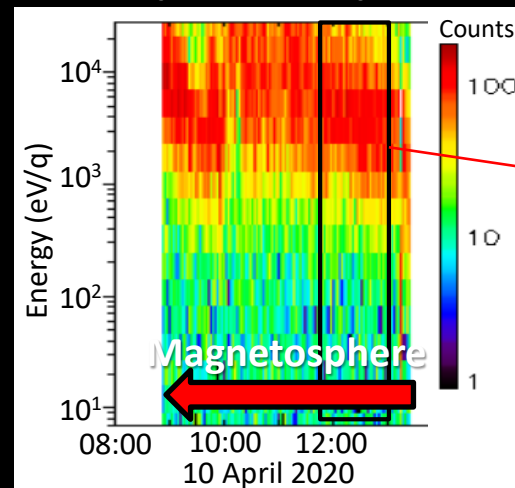
Low energy electron sensor (MPPE/MEA)



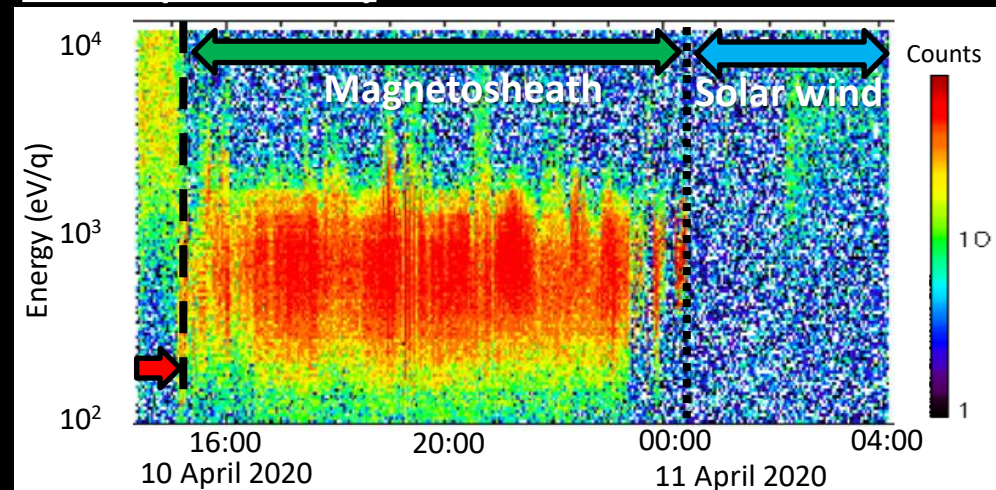
Credit: JAXA/IRAP

## Low energy ions (MIA)

### OBS-B (MS mode)

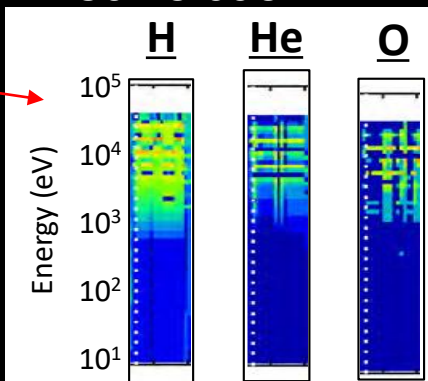


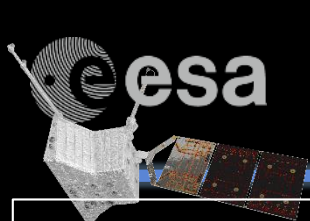
### OBS-C (SW mode)



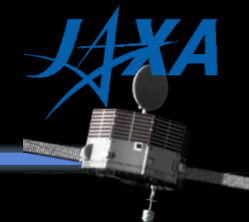
## Ion mass spectroscopy (MSA)

11:50-13:00UT



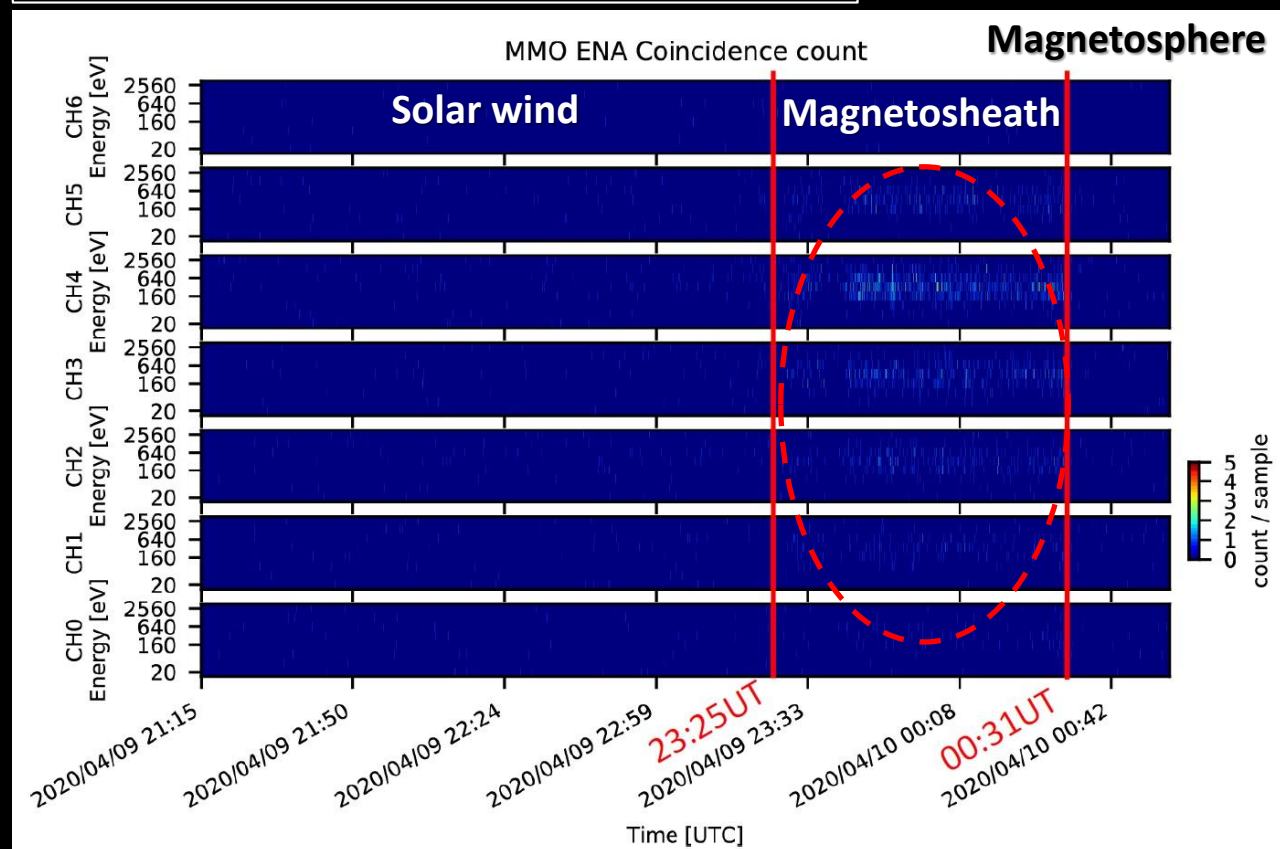


# Earth flyby: initial results (MPPE)

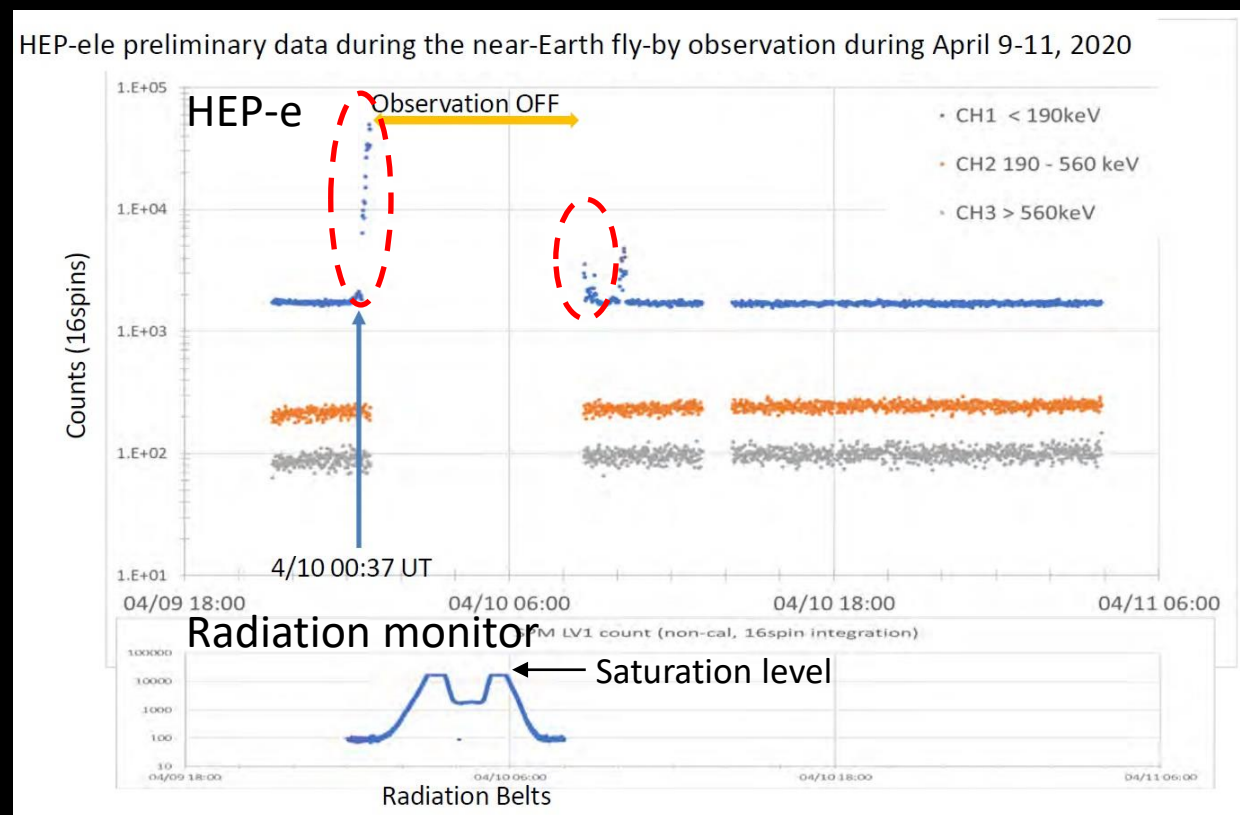


## Energetic neutral atoms (ENA)

## High energy electrons (HEP-e)



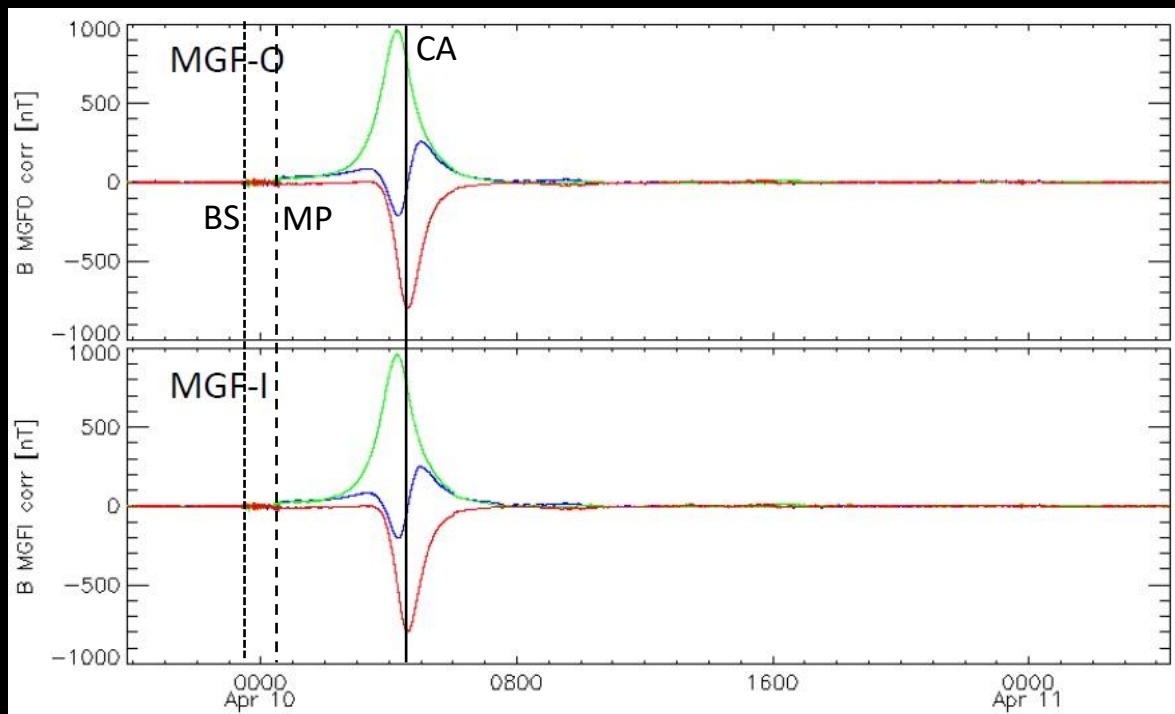
- CH0-5 are blocked by MOSIF
- Significant counts on CH1-5
- > Counts may be due to ENAs generated by neutralized reflection of ions on MOSIF



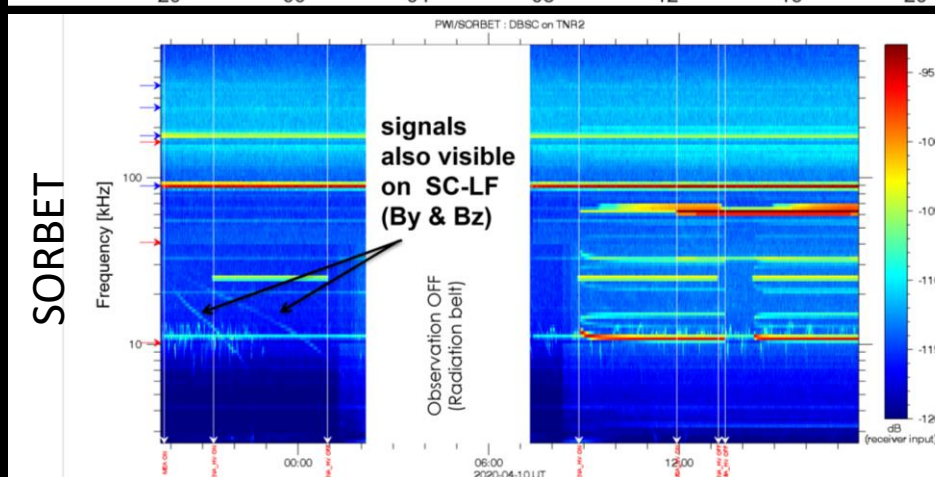
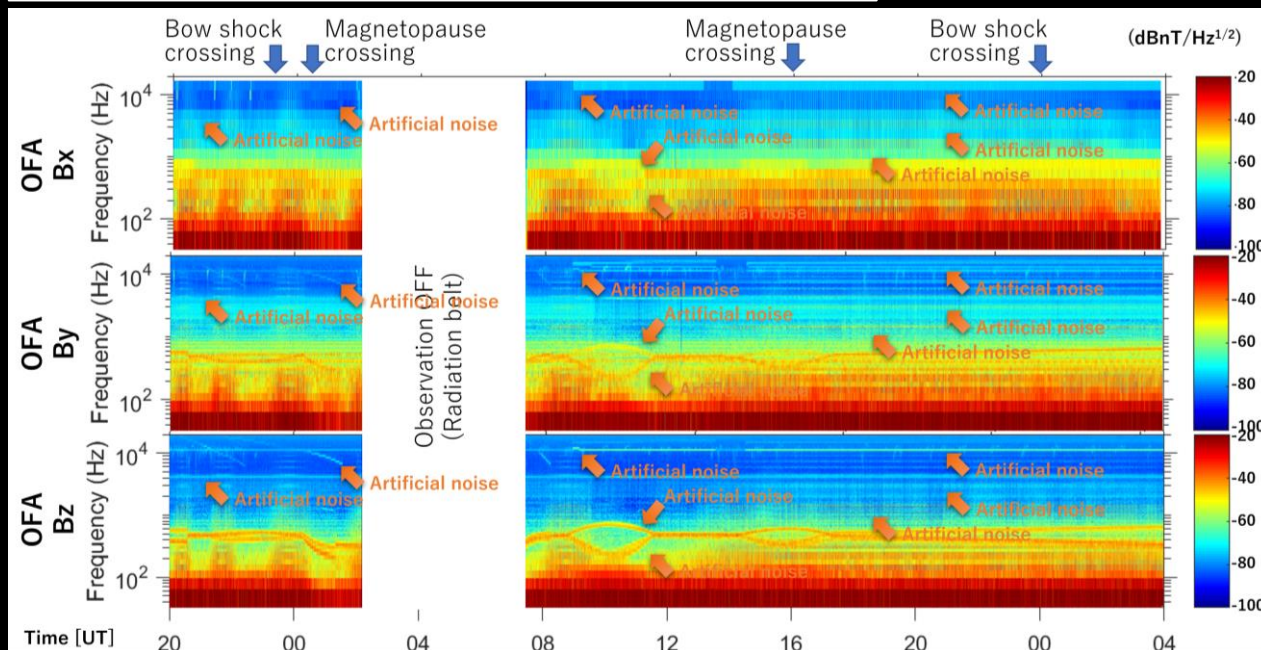
- HEP-e detected high energy (<190 keV) electrons at the outer edges of radiation belts
- Mio radiation monitor measured the radiation belt particles during the radiation belt crossing

# Earth flyby: initial results (MGF & PWI)

## Magnetometer (MGF)



## Plasma wave (PWI)



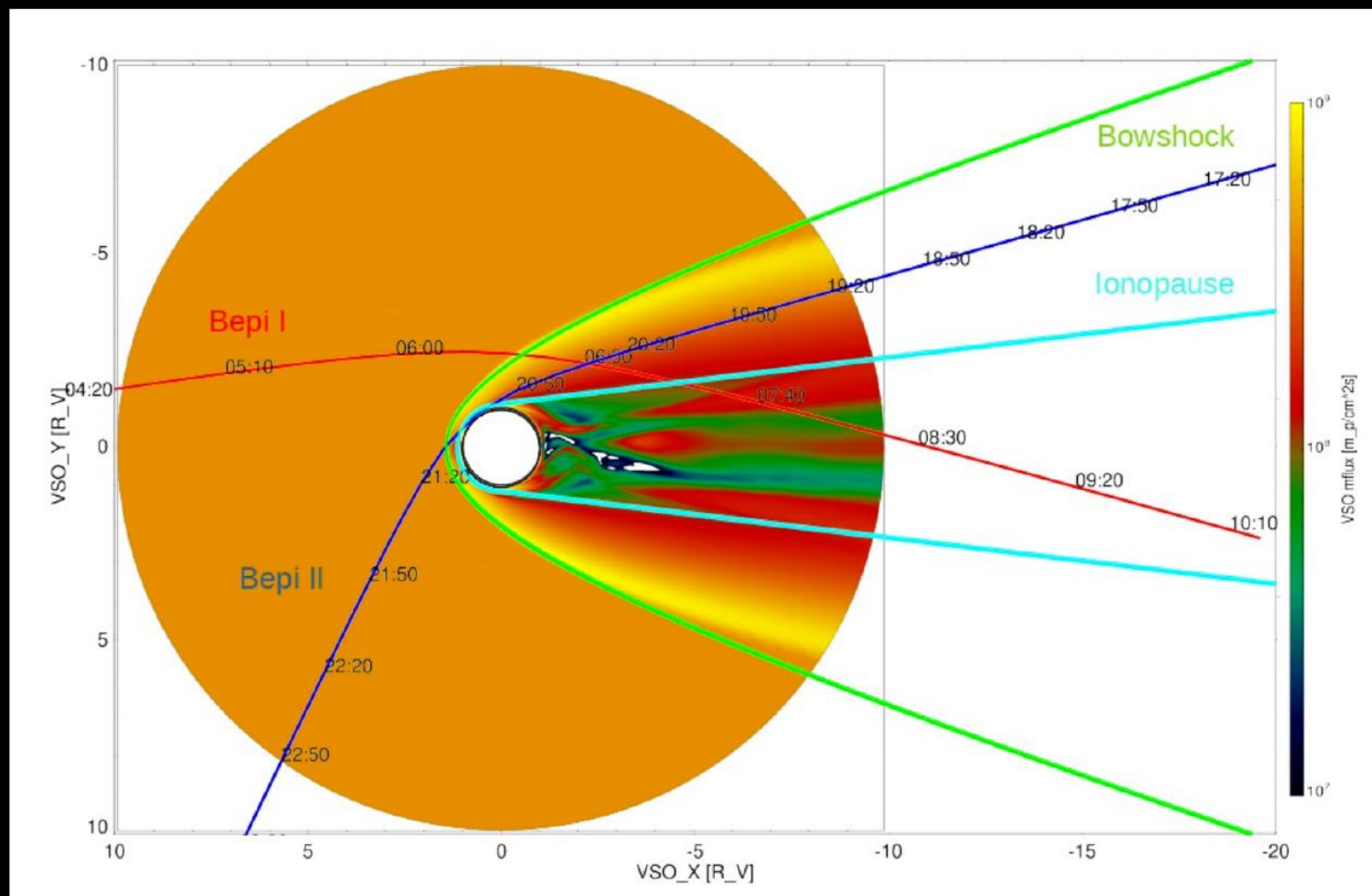
- Crossing of boundary layers (inbound) are clearly identified
- Solar wind data are used for offset determination
- Earth's magnetic fields are used for sensor alignment

# Venus flyby #1: 15 October 2020

- Closest approach: ~11000 km
- Crossing boundaries
- Plasma flows in the tail region
- Same instruments as Earth flyby
- Pointing: TBD

BepiColombo/Mio			
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	ENA		Plasma imaging 10eV-3.3keV
	MGF		Magnetic field DC - 64Hz L: <0.25Hz, M: 8Hz
	PWI		Electric field, plasma wave, radio wave DC - 10MHz (E) few - 640kHz (B)
Exosphere	MSASI		Na-exosphere image Spatial resol.: 3-30km R = 65000
Dust	MDM		Dust environment 10s pg*km/s

## Venus flyby geometry (X-Y plane)



M. Fraenz courtesy

- **MPPE/MEA**: solar wind electron temperature
- **MPPE/HEP-e**: solar energetic particles (SEP)
- **MGF**: interplanetary magnetic fields (IMF)
- **PWI (B-field)**
- **MDM**: cometary dust trail

## Expected cruise observation campaigns

- Planetary radial alignment (from Mercury to Saturn): 07B/2020
- Crossing of cometary dust trail (P/2003 T12: SOHO): 08E/2020

**MPPE FoV:**  
**perpendicular to solar wind**

