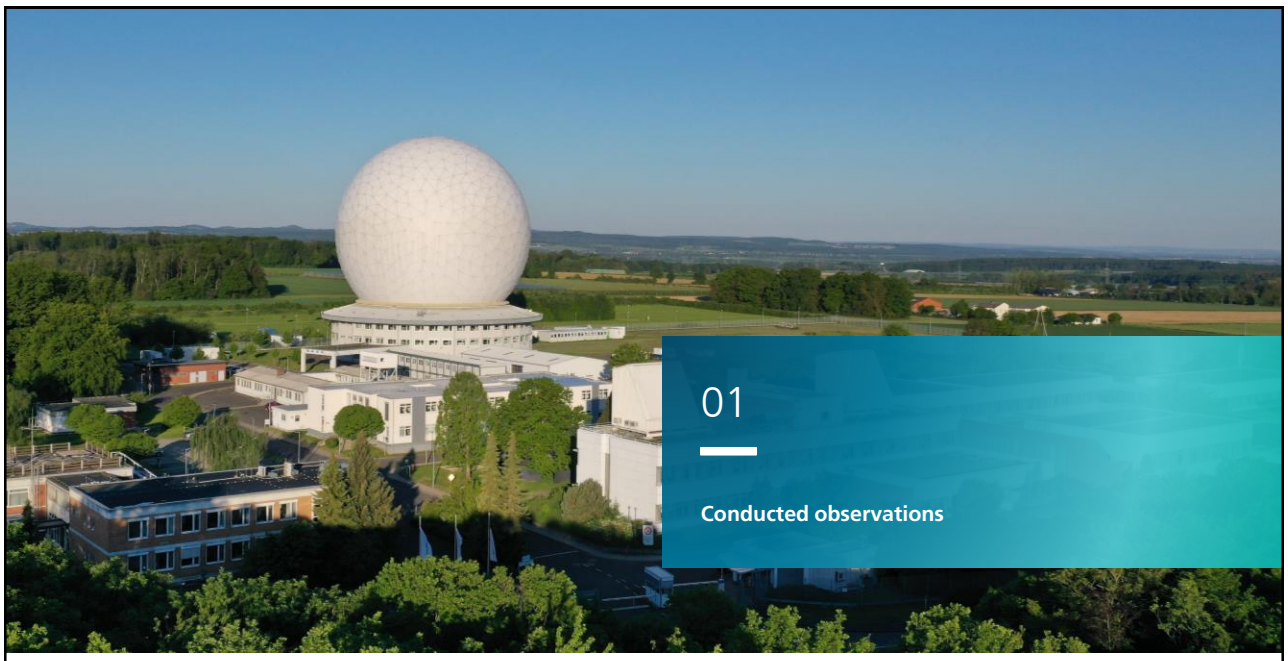
D. Cerutti-Maori, B. Bastida Virgili, T. Flohrer, J. Siminski

Observation of the re-entry of ERS-2 with TIRA



01

Conducted observations

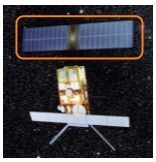
Fraunhofer FHR

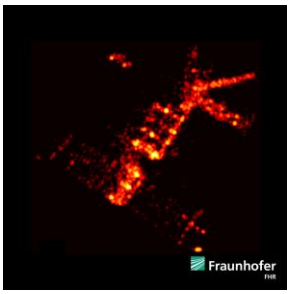
Conducted observations

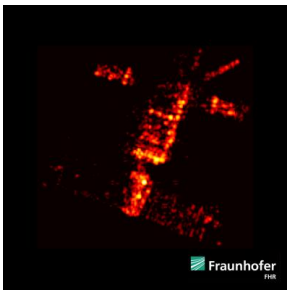
TRK/TRKI

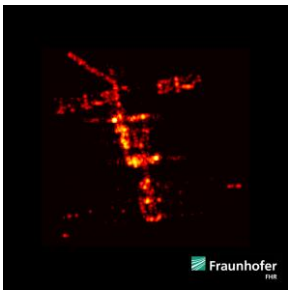
Observation	Date	DOY	Time (UTC)	Ordered by	Type
1	19.02	50	17:45	**ESA**	**TRK/TRKI**
2	20.02	51	17:24	**ESA**	**TRK/TRKI**
3	21.02	52	6:57	**ESA**	**TRK/TRKI**

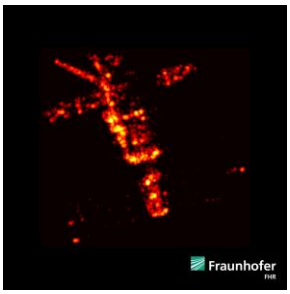
Radar images
19.02 / 17:45



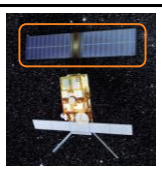


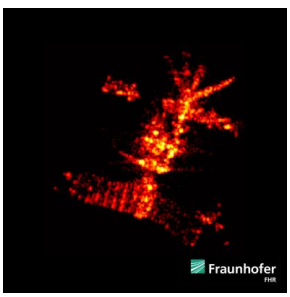






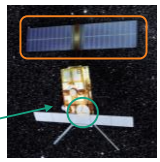
Radar images
20.02 / 17:24



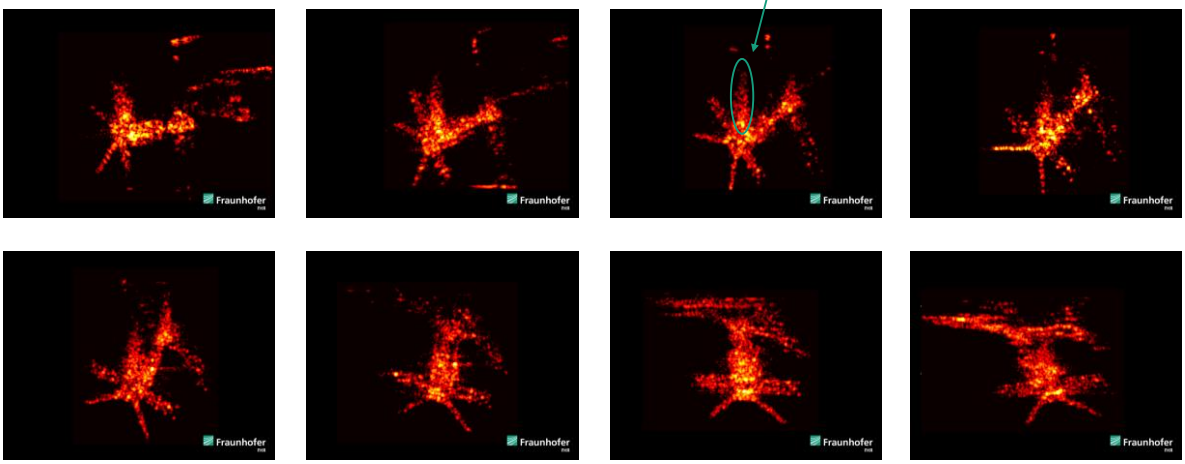


Radar image series (about 2.3s between two consecutive images)

21.02 / 6:57



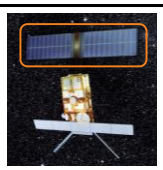
Range extended returns
(multiple reflections)



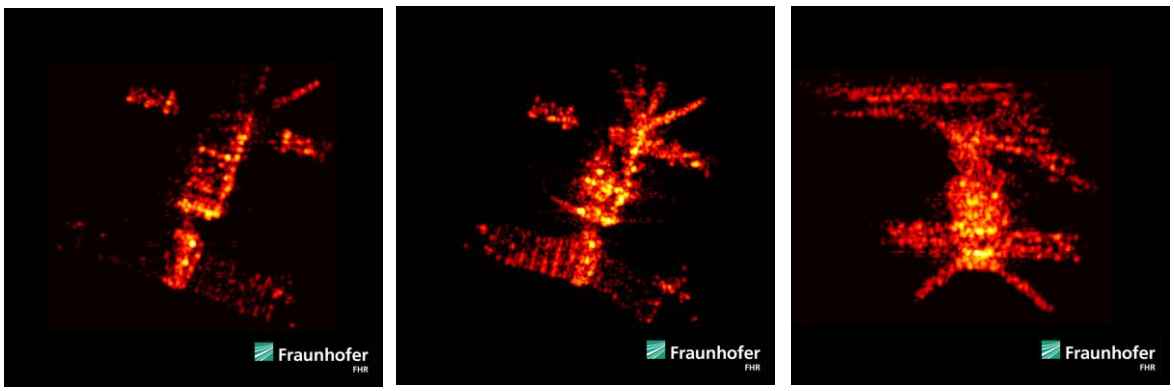
Fraunhofer FHR

Evolution of the solar panel break

Time span of about 37h



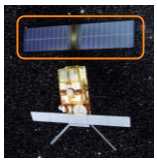
19.02 / 17:45 20.02 / 17:24 21.02 / 6:57



Fraunhofer FHR

Evolution of the solar panel break

Interpretation



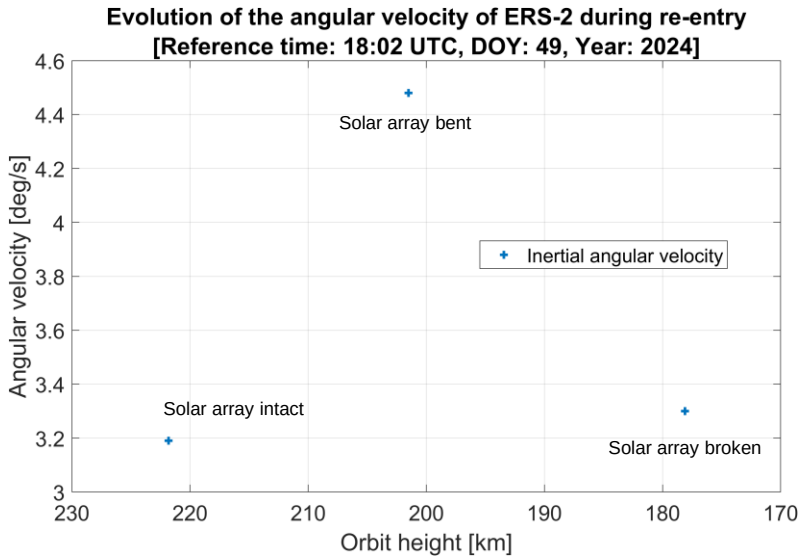
- The radar image formation assumes a rigid body
- Moving parts of an object cause a signal modulation (micro-Doppler signature), which affects the radar images in cross range
  - The micro-Doppler signal depends on the orientation of the moving parts with respect to the LOS
- The solar panel was still intact on 19.02 (17:45)
- A slight bend could be observed on 20.02 (17:24)
- On 21.02 (6:57), the solar panel is broken but still attached to the satellite
  - The solar panel motion causes a micro-Doppler signal in the radar data explaining the pattern on the right side of Figures 1 and 2
  - Also the solar panel in Figure 8 looks larger as it is
  - ERS-2 is not a rigid body any more

03

Attitude motion

Angular velocity
Evolution during re-entry

- ERS-2 speeded up until ca. 24h prior to re-entry, then slowed down
- A cause of the slow down was the damaged solar array



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Angular velocity
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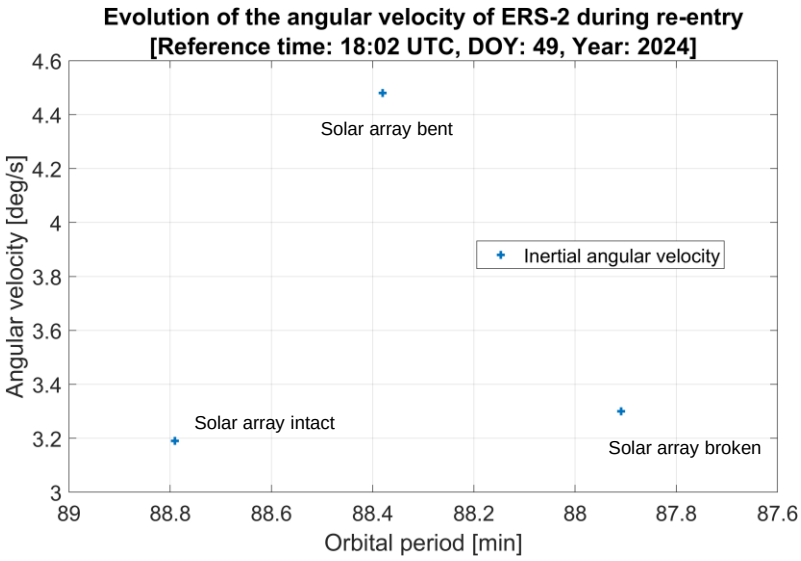

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Thank you for your attention! Questions?

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Contact

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