Sentinel-1A Solar Array Impact

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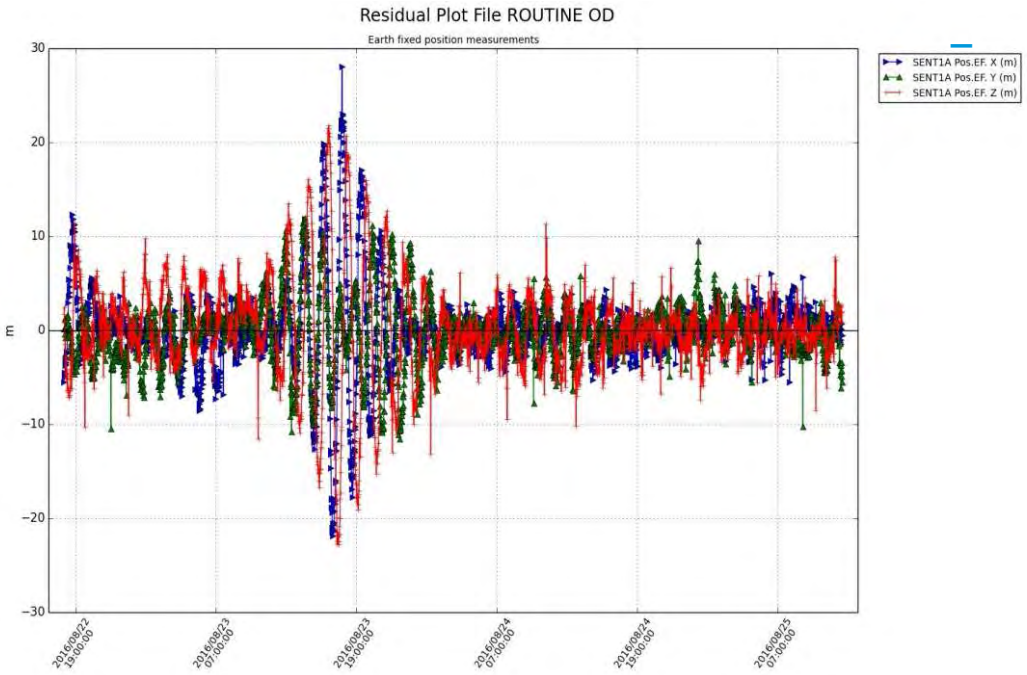
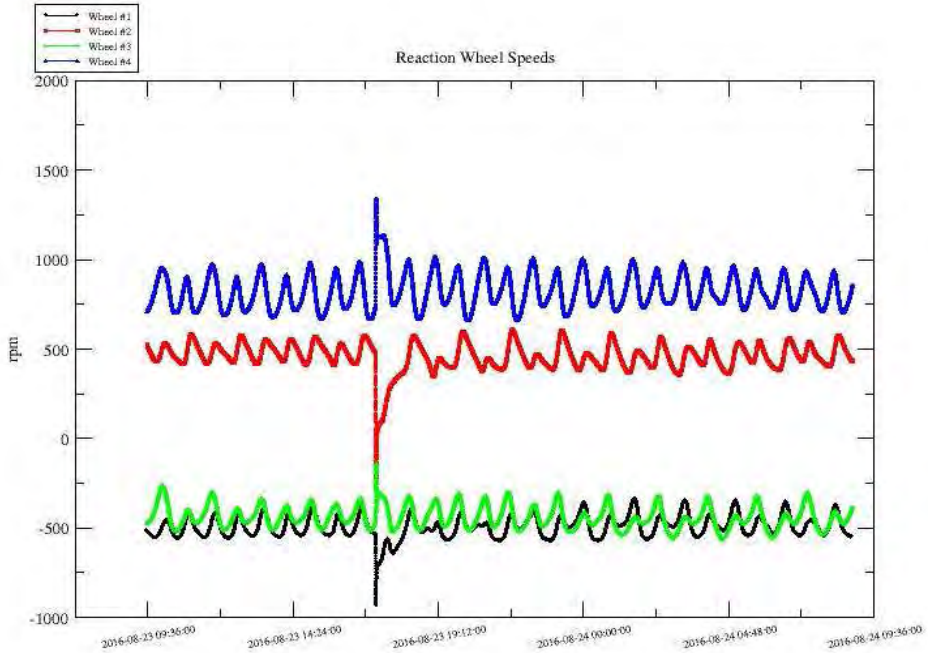
Sentinel-1A Impact 2016/08/23

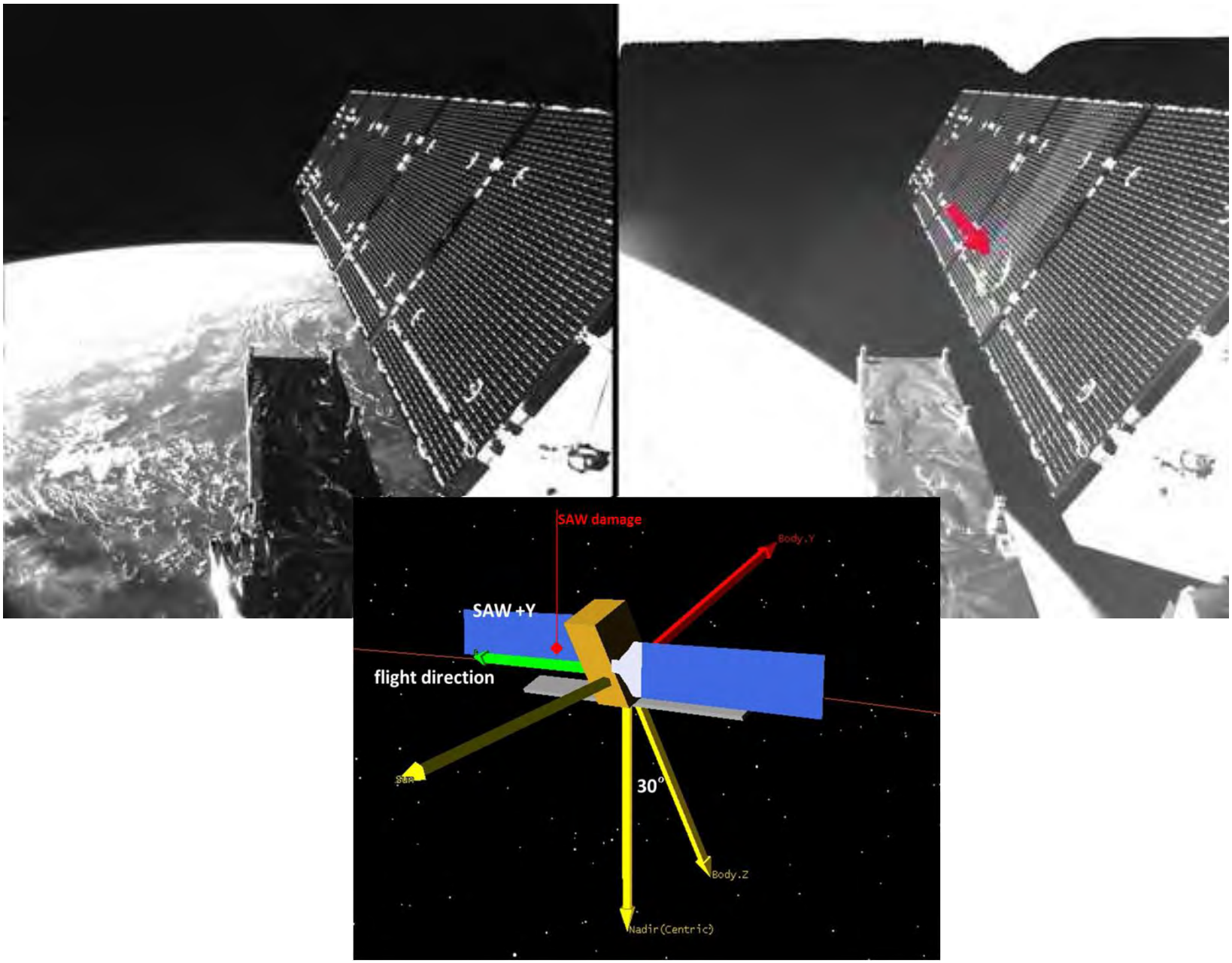


- At around 17:07 UTC:
  - Inconsistency in the GPS-based orbit solution
  - Ad-hoc change in the wheel rates
  - The output power of the SAW+Y Solar array dropped by 280W from a nominal 6000W on 2016/08/23 17:07:47 UTC

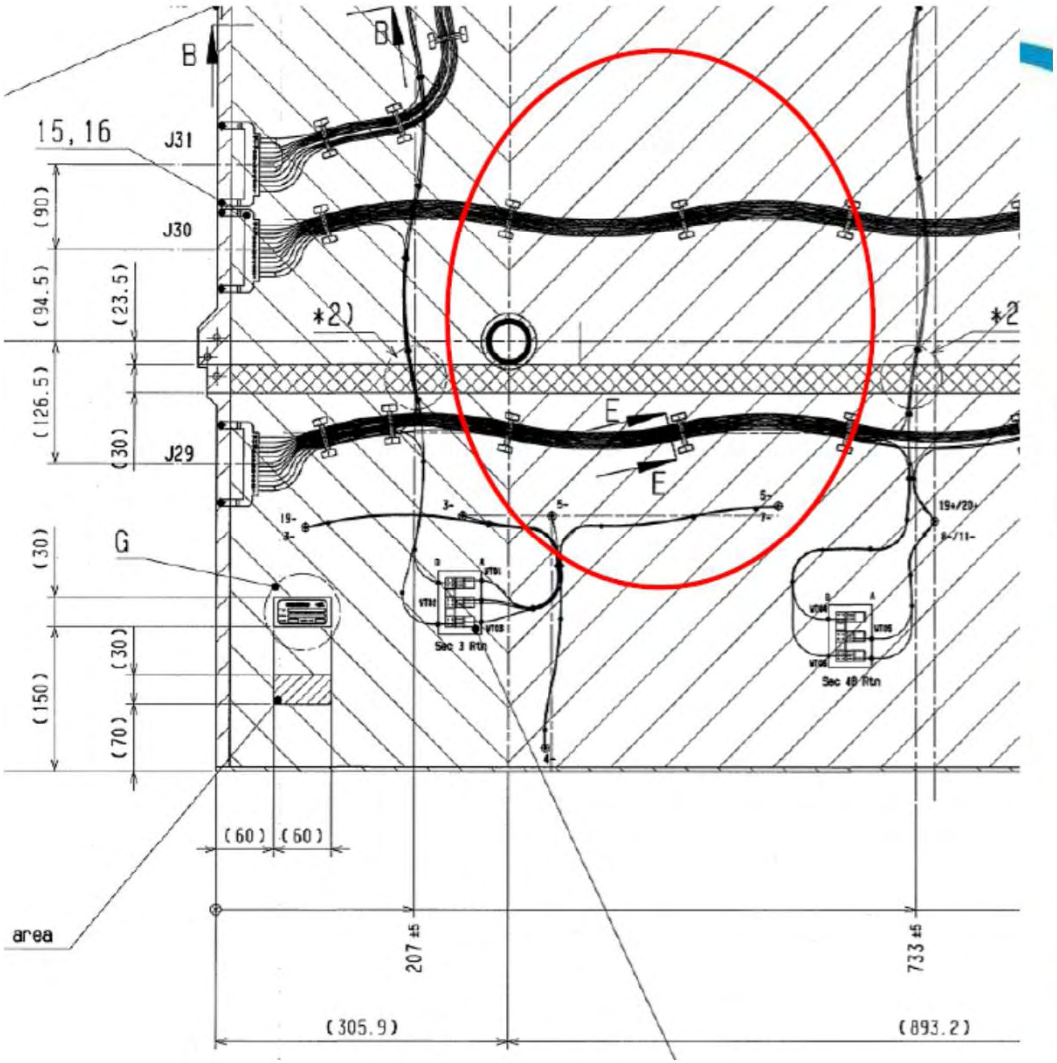
- After analysis:
  - Loss of about 5% solar array
  - Orbit change by 0.7mm/s
  - Attitude changed by a few degree
  - USSTRATCOM tracks 8 fragments



Sentinel-1A Impact 2016/08/23 – Onboard Camera

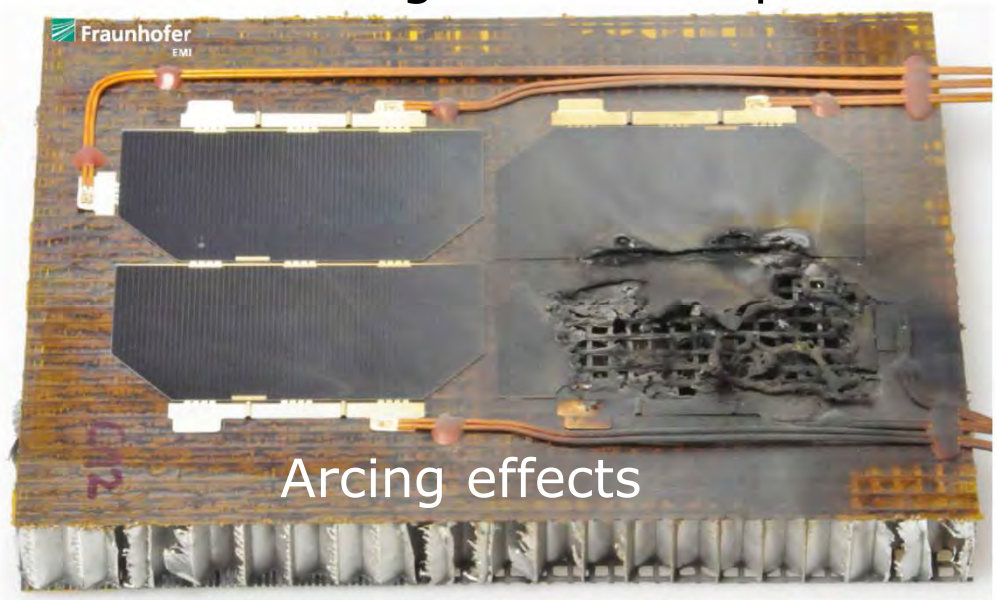


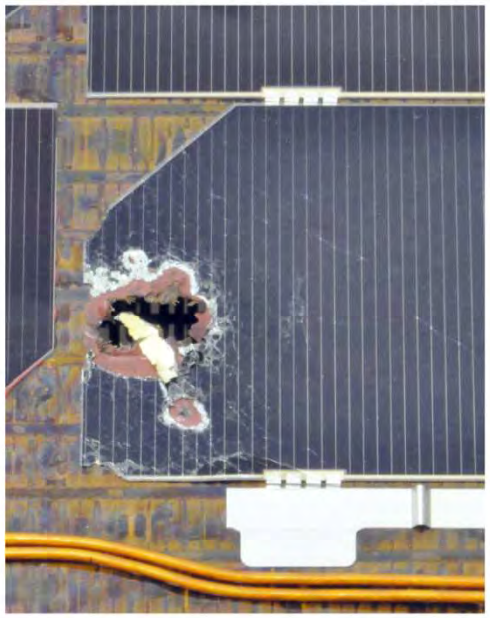
Damage Assessment

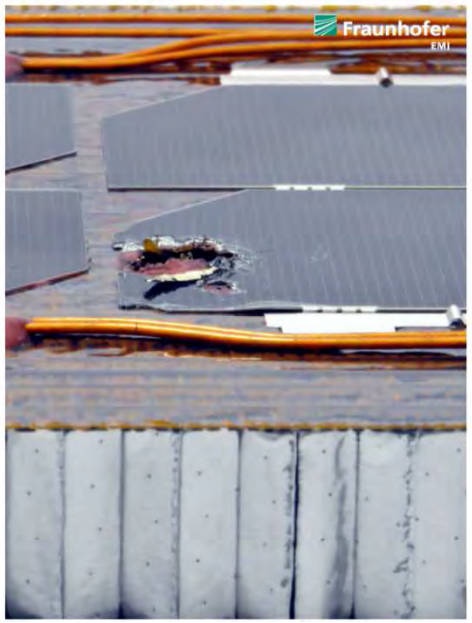


Source: Airbus

1mm 45deg rearside impact

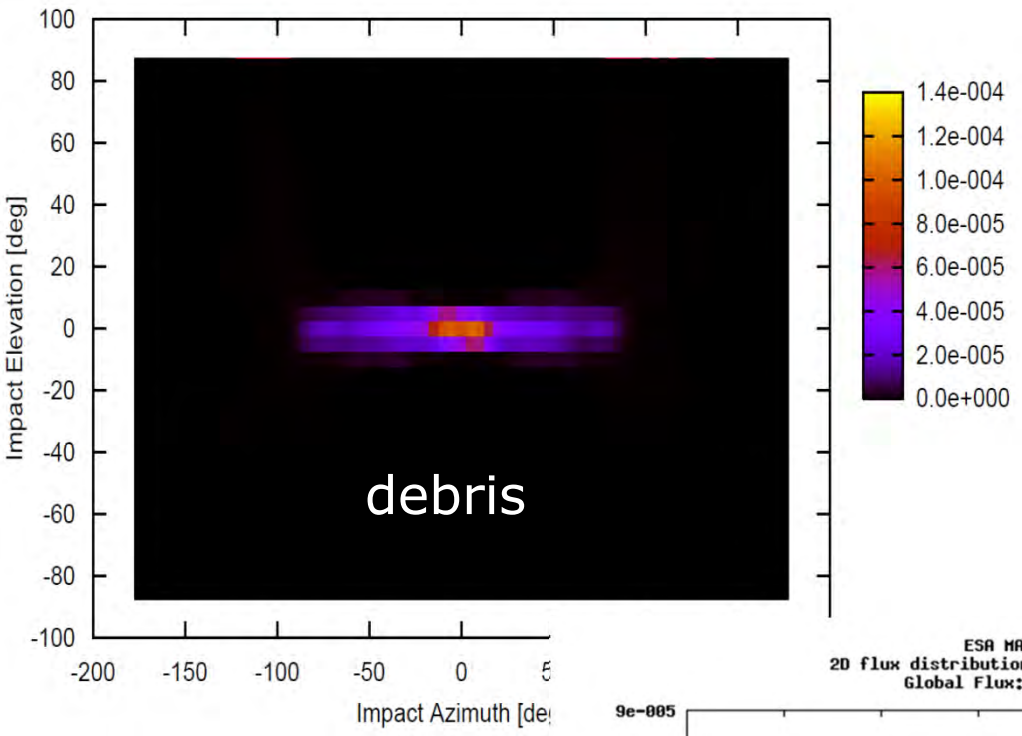


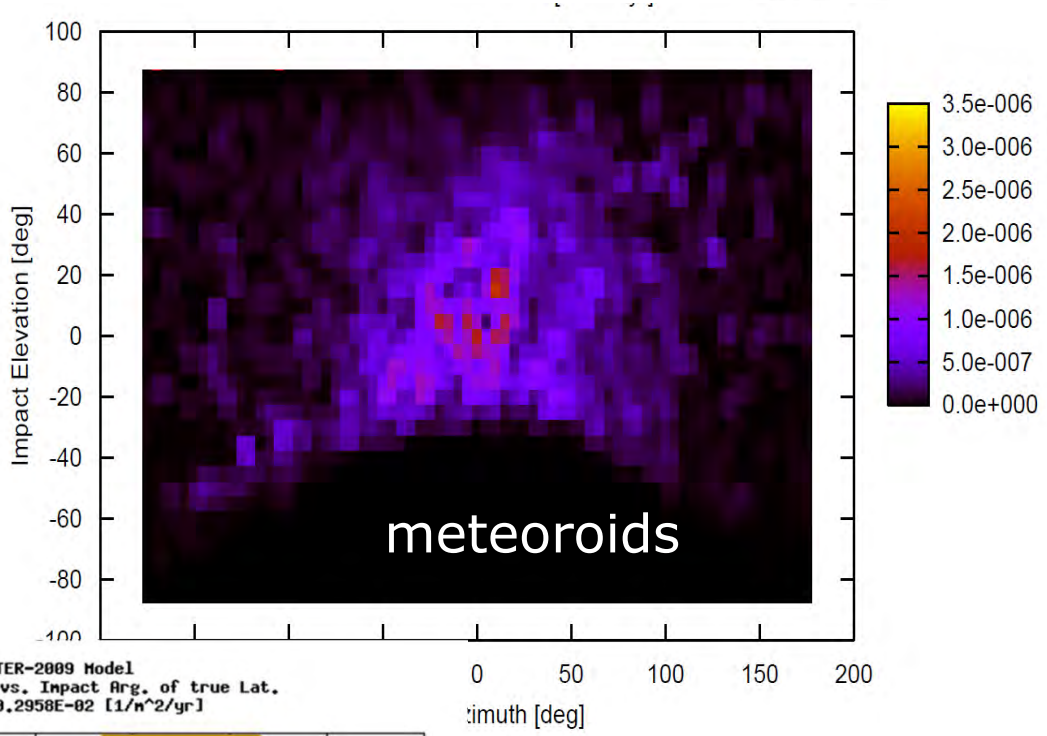


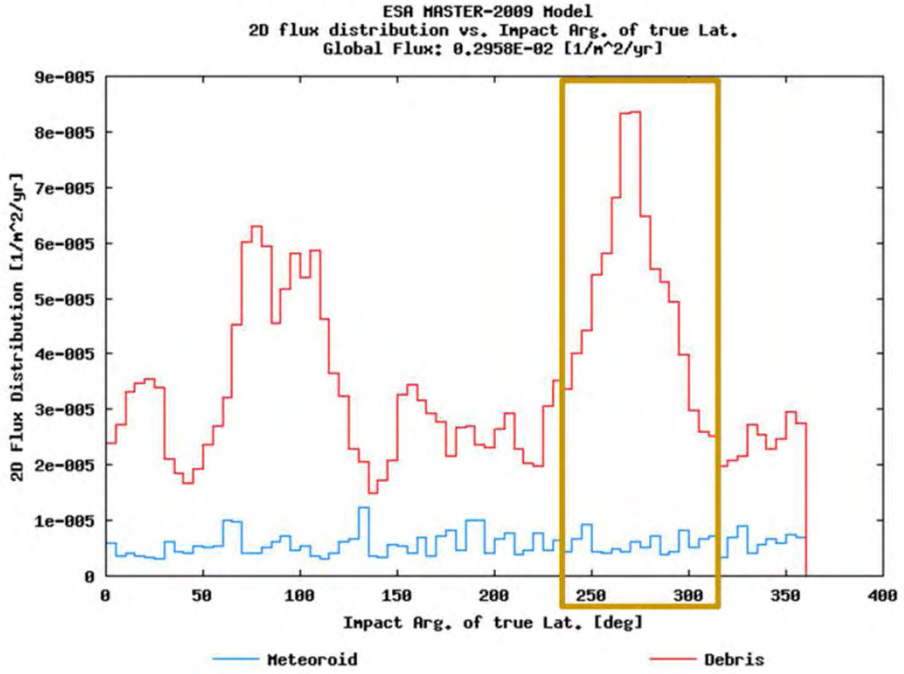


Source: Fraunhofer EMI

Assessment of the Originator







Conclusions

- The Sentinel-1A anomaly of 2016-08-23 17:07:37 UTC was caused by a hyper-velocity impact.
- Attitude and orbit changes, the type of observed damages, the impactor directionality and the latitude of the spacecraft at impact all point to man-made debris.
- With this, it is safe to conclude that a man-made piece of debris (most likely an explosion or collision fragment) of 0.2g mass and approximately 1cm size was the impactor. It approached with about 11km/s. Its equivalent diameter as an aluminium sphere would be about 5mm.
- The impact occurred onto the back side of the leading solar array (SAW +Y) under an approach angle along the horizontal plane with an off-angle of 45degree from flight direction.
- A total of 7 fragments seem to have been released into the direction of approach of the impactor (TBC) and are currently tracked by USSTRATCOM.
- In view of this, the break-up has more the character of an “impact” rather than a “collision”, which would be a result of a penetration with fragment ejection into both out-of-plane directions.