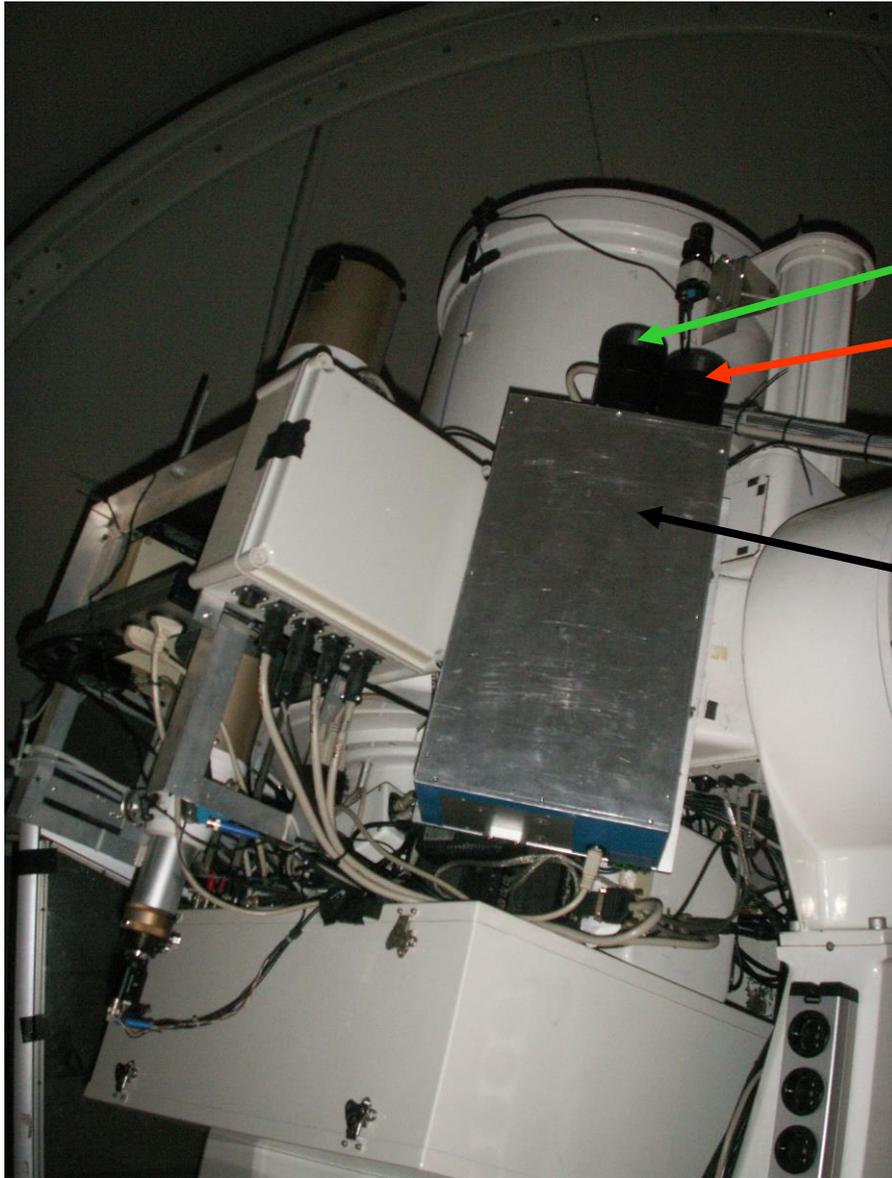


## Space Debris Study Group Meeting - Canberra, Nov. 2018, on a very early morning ...

- The number of space debris targets – and therefore the danger - is increasing every year; no saturation in sight...
- Consequently, actions to control this are also increasing now at several locations:
  - SERC / Australia is building new dedicated SLR stations for debris: Large telescopes, kW lasers, adaptive optics / guide star systems etc.
  - Several Chinese stations are routinely tracking space debris
  - European SLR stations have joined or will join the debris laser ranging club: Graz, Borowiec, Wettzell, San Fernando; Metsahövi, Yebes, ESA SLR etc.
- Adding Light Curve (LC) recording adds significantly more information (attitude...); intensive analysis allows spin attitude determination out of 1-pass data
- Time Transfer experiments via space debris targets are in preparation
- Bistatic Laser Ranging between Graz and Potsdam has been tested successfully
- Graz mounted the new debris laser on the telescope; works perfect
- The Graz SDSG server is extensively used for debris data storage and exchange
- Several requests were handled fast and efficient (Topex/Jason-2, Envisat etc.)
- Daniel Kucharski was appointed as new co-chair for SDSG

# Graz has installed an SD laser head on the mount / telescope



2018: New Debris Laser in Graz (Innolas)

- 200 Hz / 3 ns / 2 wavelengths:

- **532 nm: 80 mJ / 16 W; or**

- **1064 nm / 160 mJ (32 W)**

- Temperature Stabilized Housing

- Water Cooled Laser Head

- Mounted on Graz telescope:

- No Coudé Path needed

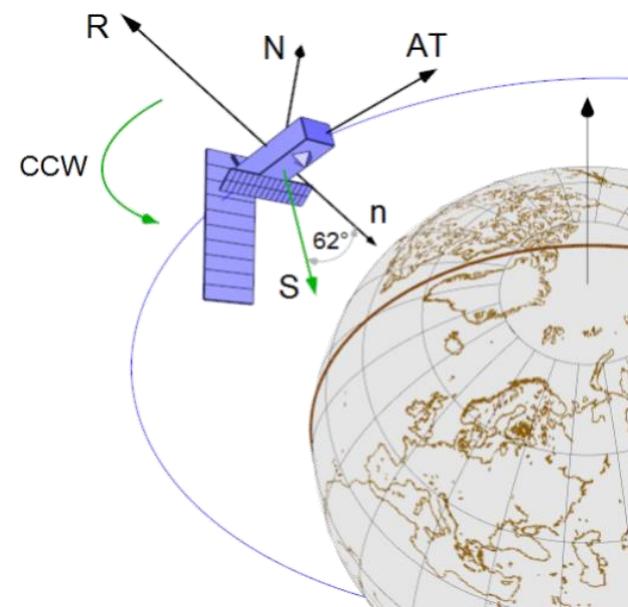
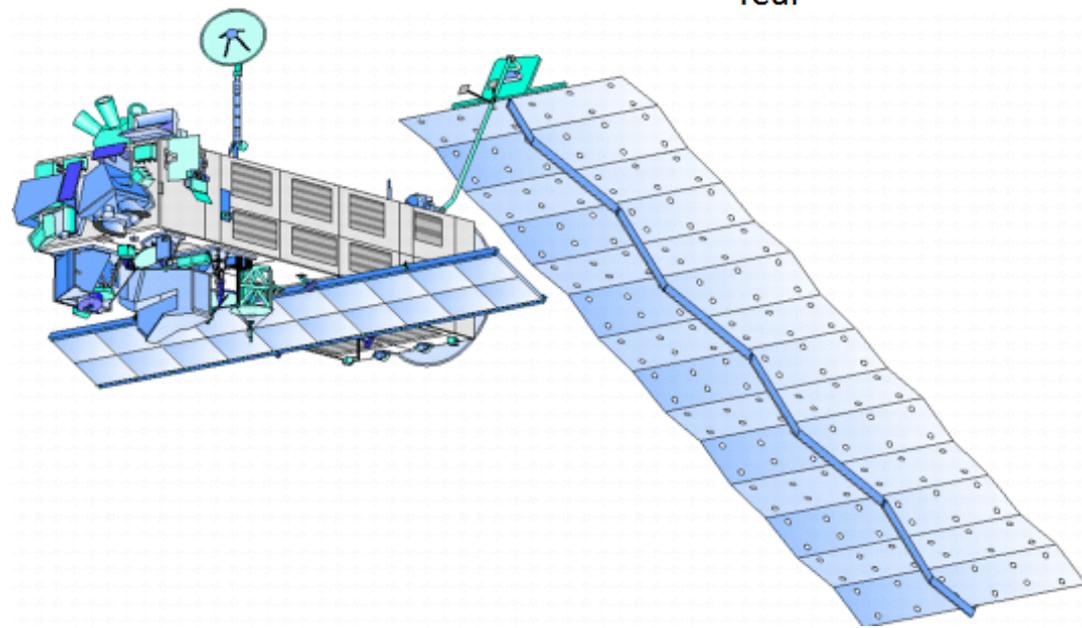
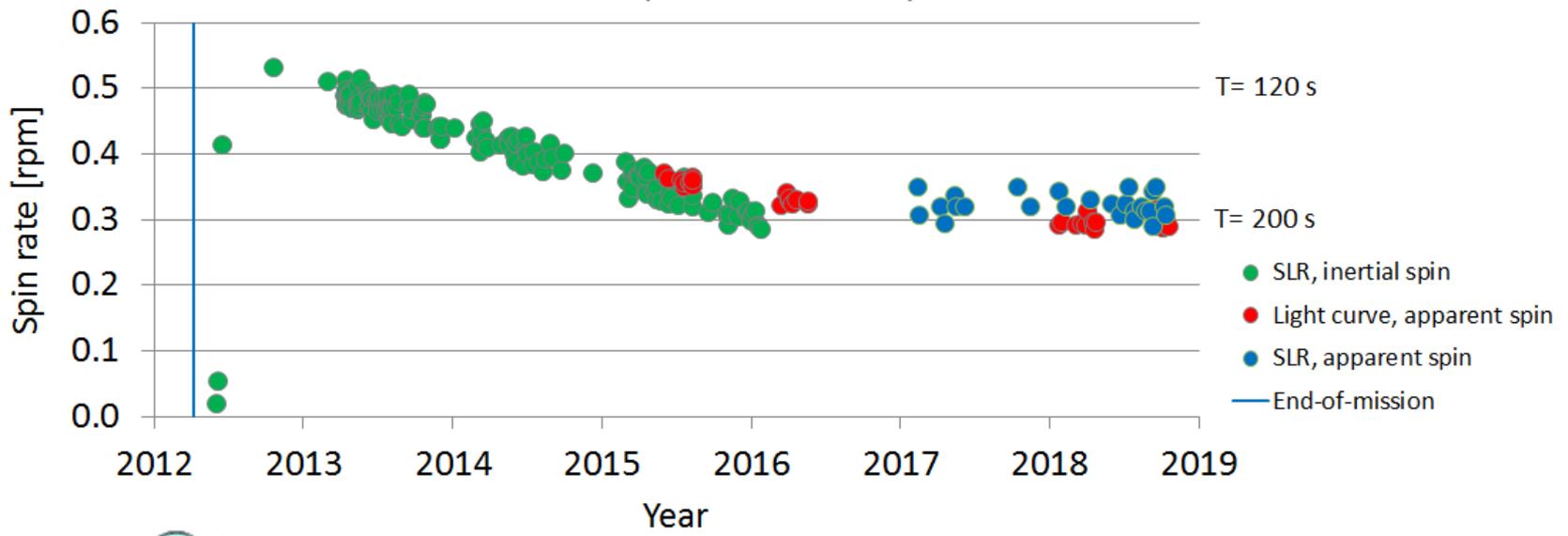
- Fixed alignment

- Used now for routine SD tracking

- Operates independantly from or parallel to standard ps laser (Coude)

# Space Debris Study Group meeting, Tue. Nov 6.

### ENVISAT, spin rate history



# Space Debris Study Group meeting, Tue. Nov 6.



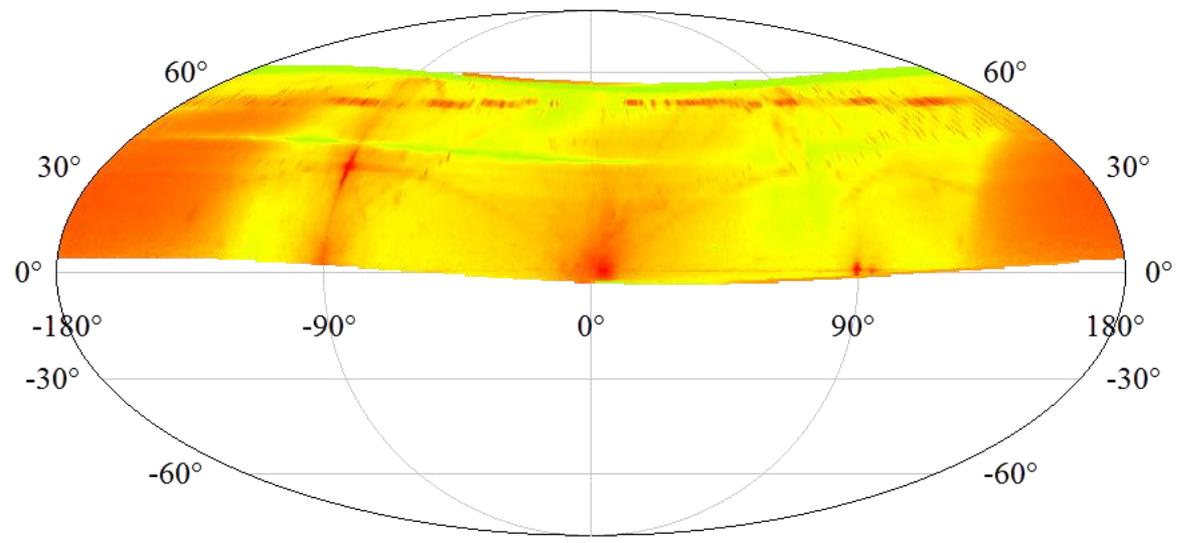
$$P_{BCS} = S P_{ICS}$$

$$S = R_2(-x_p) R_1(-y_p) R_3(\gamma) R_1\left(\frac{\pi}{2} - \delta\right) R_3\left(\frac{\pi}{2} + \alpha\right)$$

$\alpha$ : spin axis RA                       $\gamma$ : spin angle  
 $\delta$ : spin axis Dec                     $x_p, y_p$ : pole position

spin axis: RA = 94.3°, Dec = -64.8°  
 spin period = 11.308 s  
 pole position:  $x_p = 3.1^\circ, y_p = -1.6^\circ$  (offset = 3.5°)

1) Reflectivity map, log intensity scale



Time independent pattern, fixed with the satellite body

2) Polar, N

