

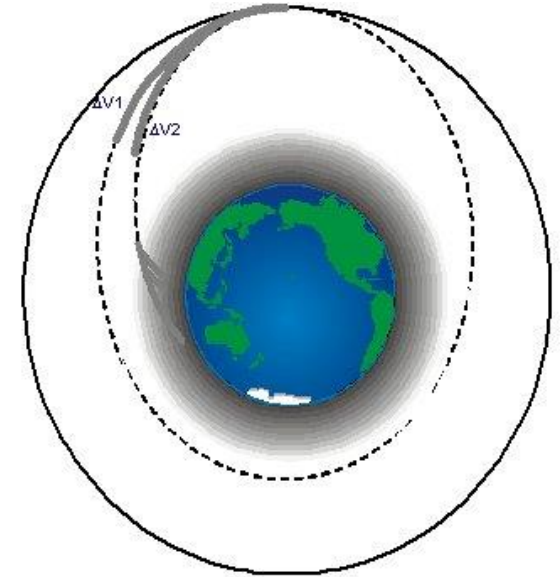
Panel
Space Debris Risk for Aviation
P.Wilde, F.Alby

Planned and Unplanned Reentries

ATMOSPHERIC RE-ENTRIES

Controlled reentries

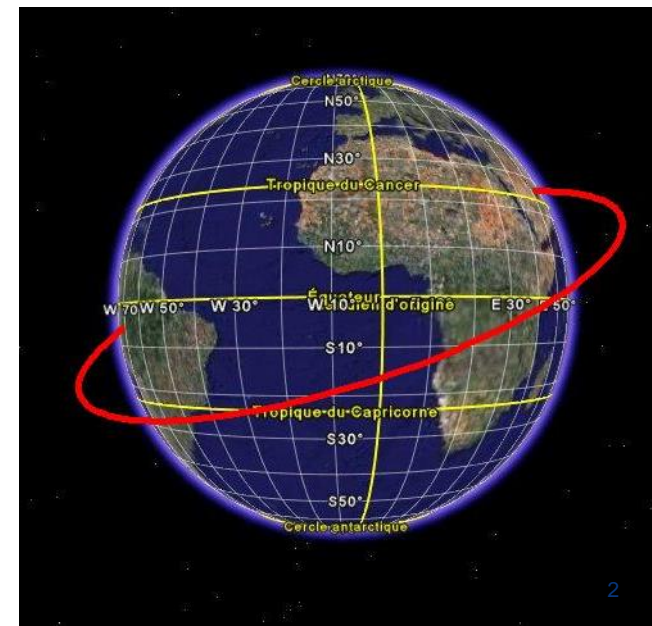
One or several manoeuvres
 Dates of manoeuvres determine reentry zone
 Reentry zone over large uninhabited area



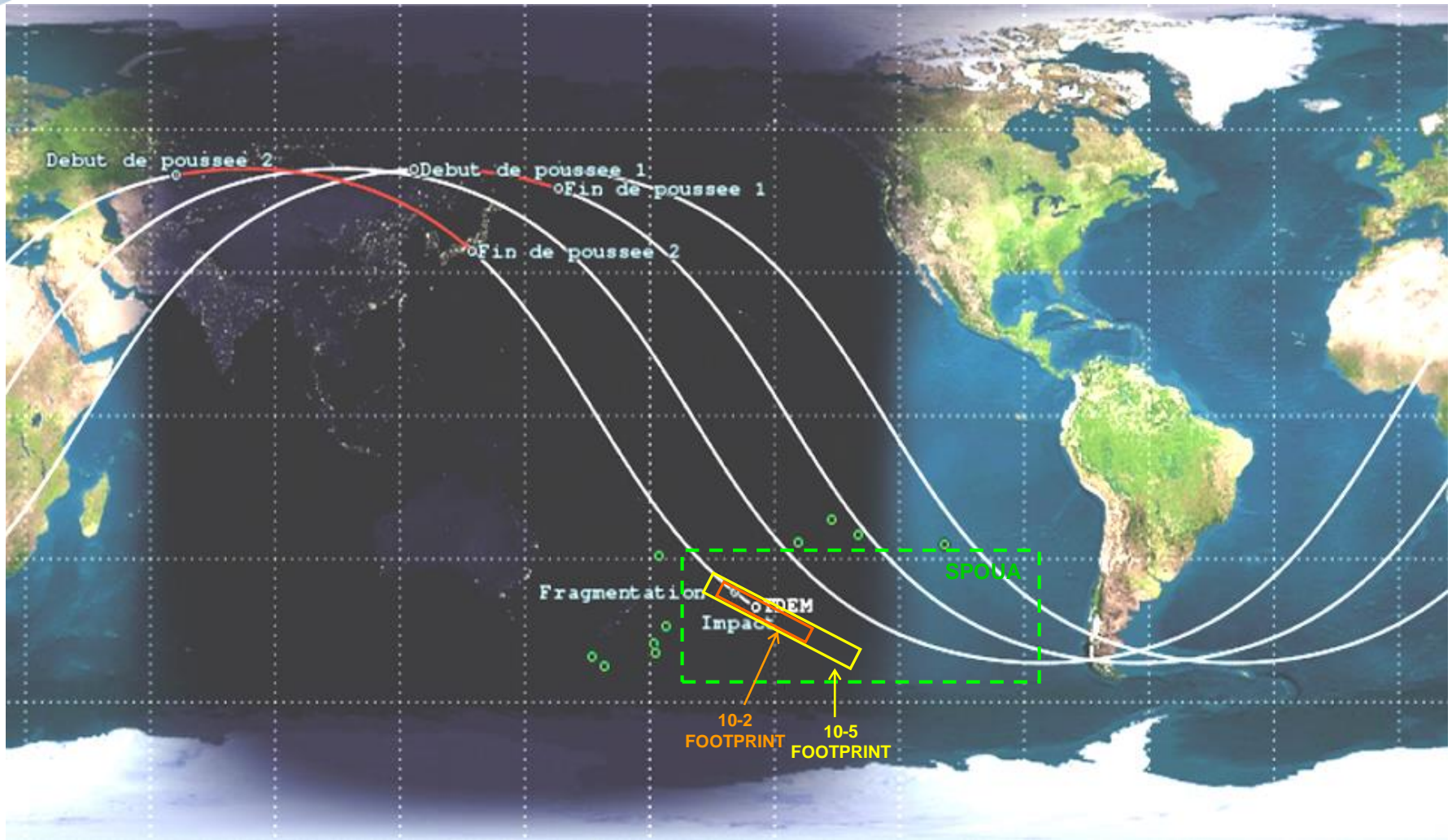
Uncontrolled reentries

Atmospheric drag
 → altitude lowering.

Random reentry in the latitude band corresponding to the inclination.



Controlled reentry



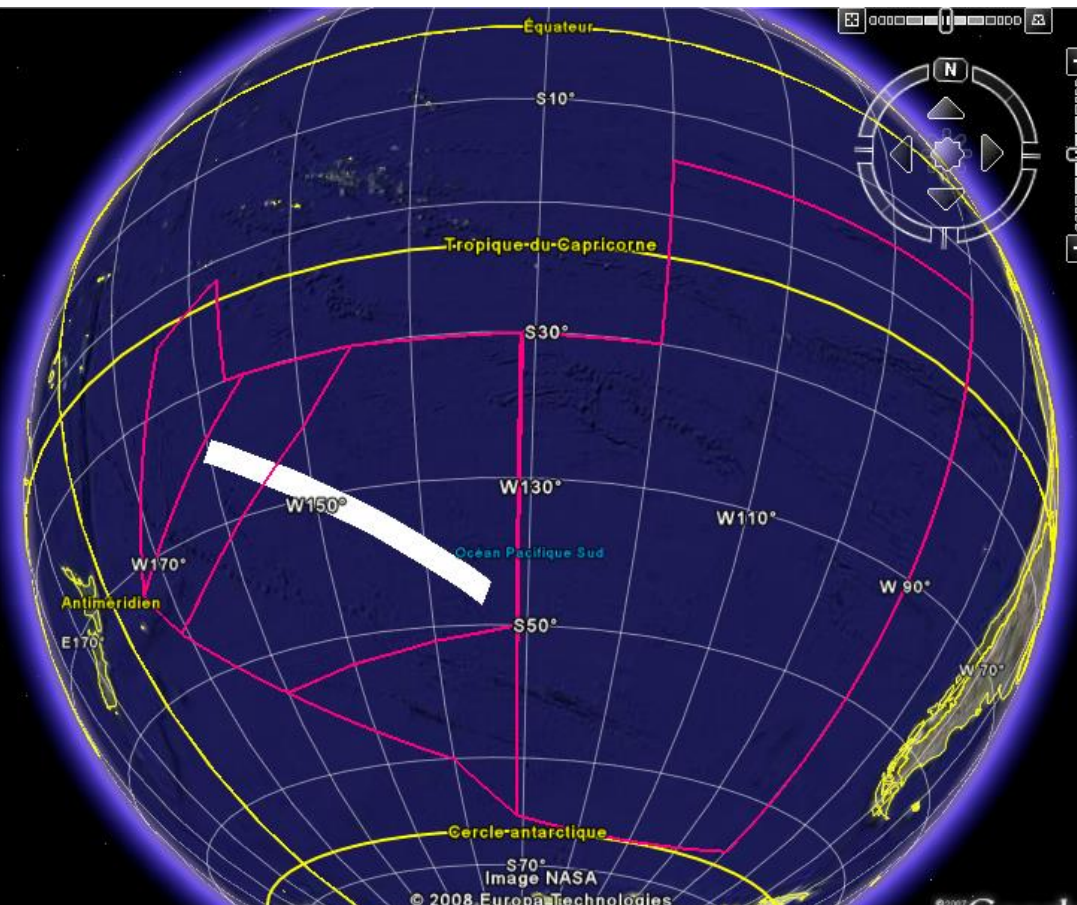
Controlled reentry

NOTAM ATV-1 REENTRY

Debris fallout on 29 September
2008 from 12h46mn UT until
14h46mn UT

Zone defined by the 4 points :

- Point 1 : latitude $33^{\circ} 48' 40''$ S
longitude $159^{\circ} 29' 13''$ W
- Point 2 : latitude $47^{\circ} 00' 54''$ S
longitude $133^{\circ} 32' 49''$ W
- Point 3 : latitude $48^{\circ} 38' 56''$ S
longitude $134^{\circ} 39' 32''$ W
- Point 4 : latitude $35^{\circ} 07' 23''$ S
longitude $160^{\circ} 58' 37''$ W



Uncontrolled reentry

■ Difficulty to predict the footprint:

- ◆ Incertitude on atmospheric density, variability of the solar activity
- ◆ Knowledge of the ballistic coefficient C_D S/M coefficient: unknown attitude
- ◆ Possible “lift” effect
- ◆ Very short observation periods (low altitude)

■ Order of magnitude of the accuracy:

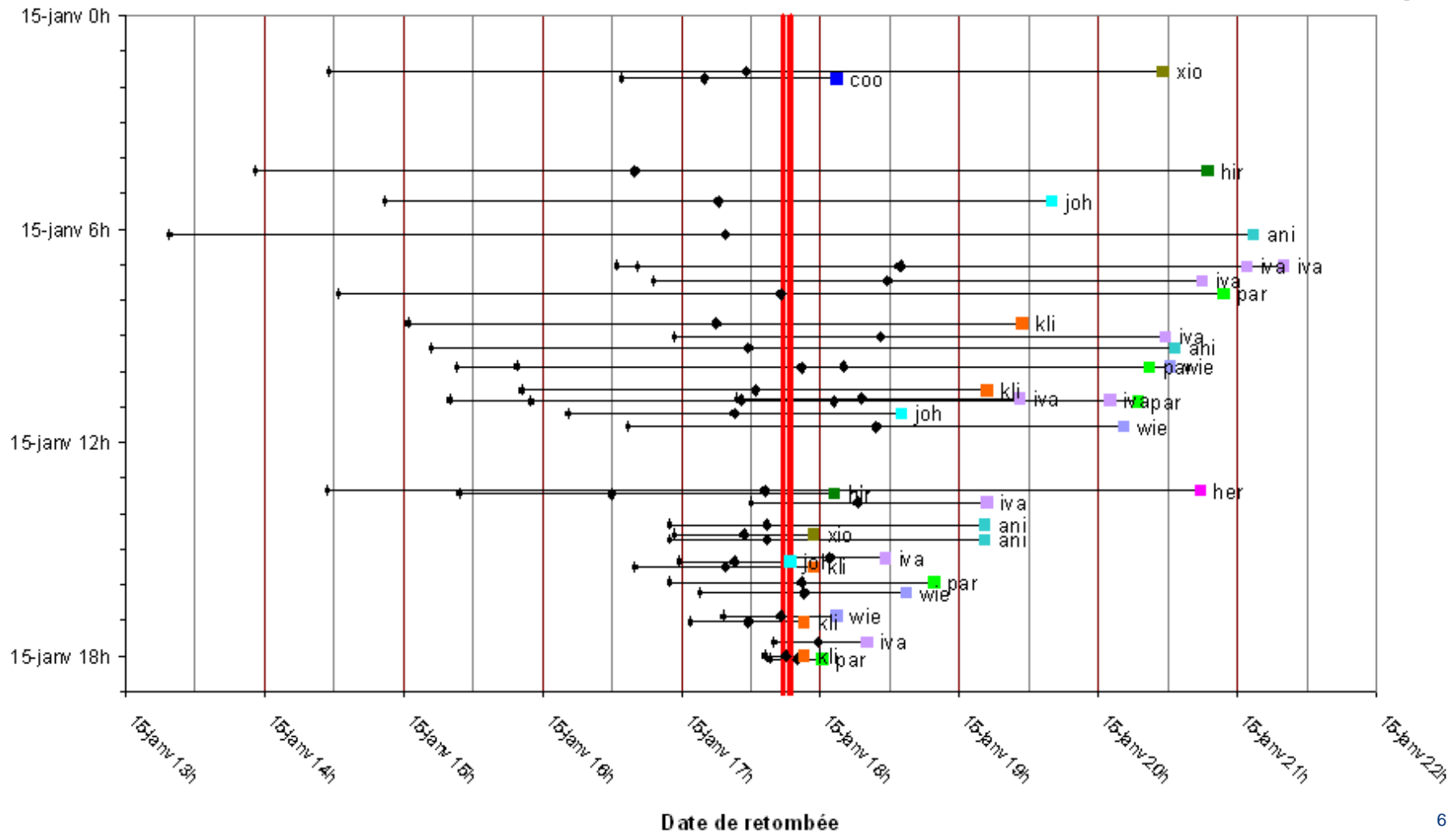
10-15% of the remaining time.

Example:

- 1 week before: 1 day → 16 revolutions
- 1 day before: 3 hours → 2 revolutions
- 12 hours before: + or – 1 revolution

Uncontrolled reentry

Exercice IADC 2012 - PHOBOS-GRUNT



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Last predictions of participating Agencies

