

Doing More with Less Panel Discussion GSAW 2013

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$$\sin u + \sin v = 2 \sin \left(\frac{u+v}{2} \right) \cos \left(\frac{u-v}{2} \right)$$

$$\sin u - \sin v = 2 \cos \left(\frac{u+v}{2} \right) \sin \left(\frac{u-v}{2} \right)$$

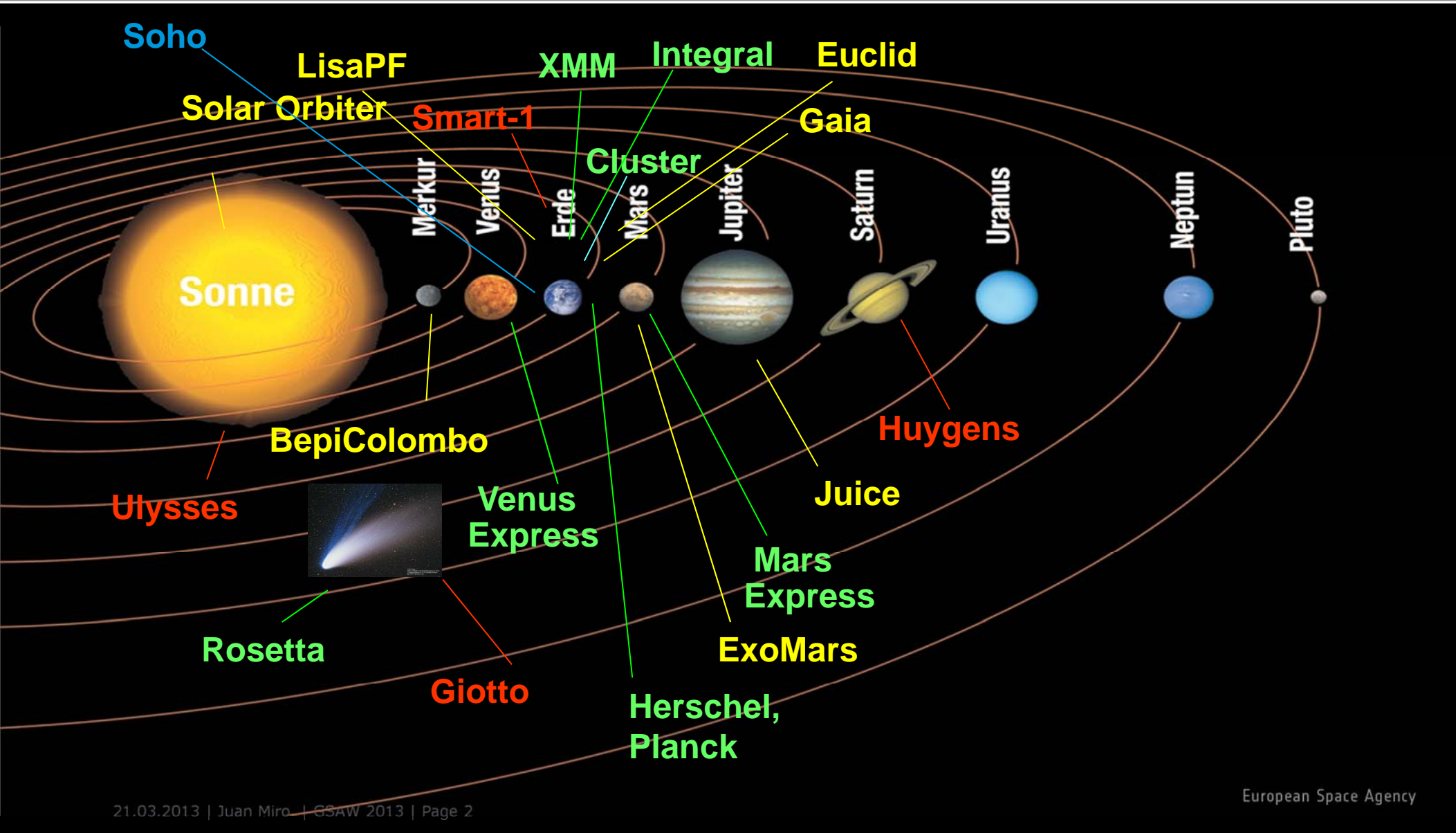
$$\cos u + \cos v = 2 \cos \left(\frac{u+v}{2} \right) \cos \left(\frac{u-v}{2} \right)$$

$$\cos u - \cos v = -2 \sin \left(\frac{u+v}{2} \right) \sin \left(\frac{u-v}{2} \right)$$

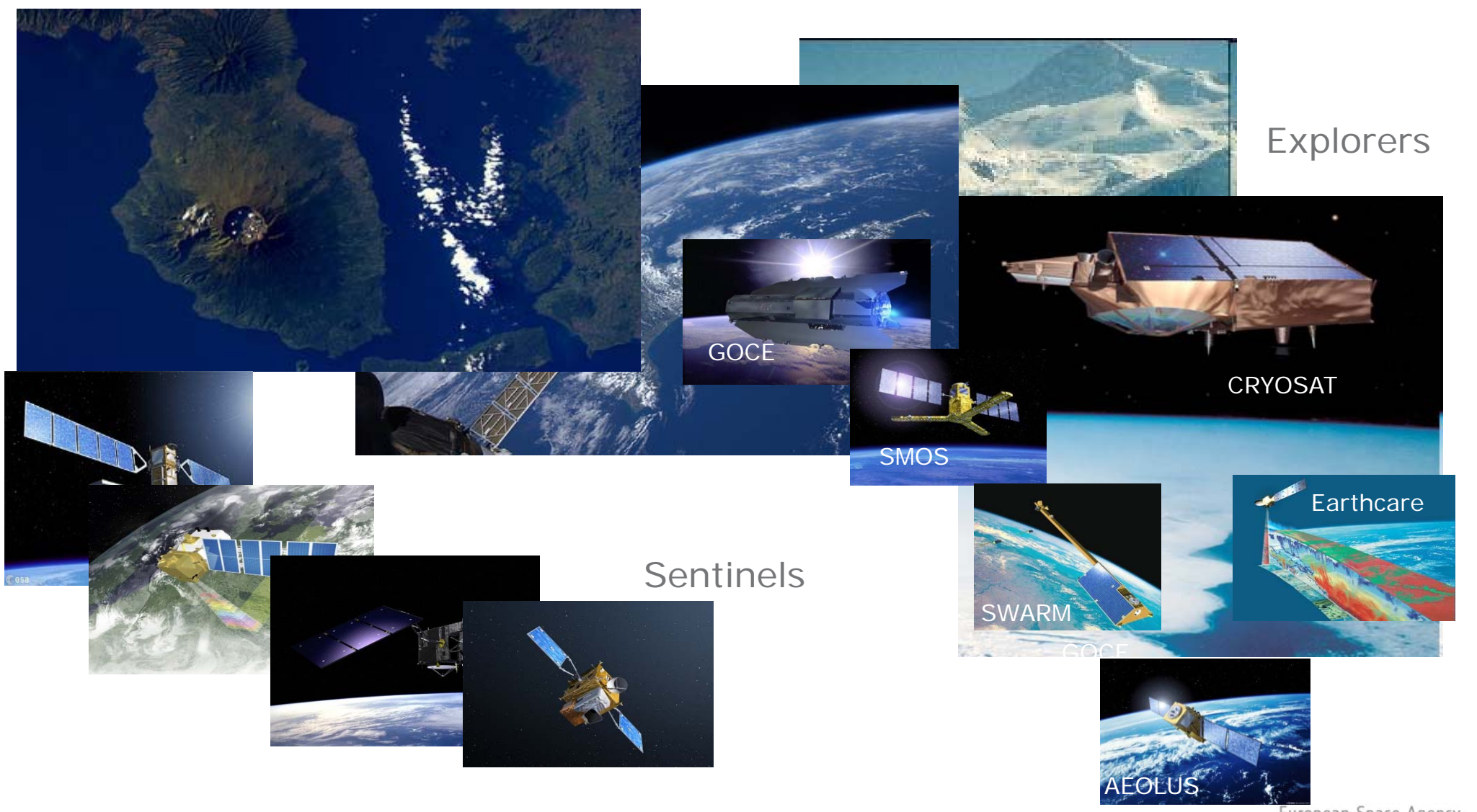
$$A = \pi$$



ESA Science Missions in the Solar System



ESA Earth Science Missions



Explorers

GOCE

CRYOSAT

SMOS

Earthcare

Sentinels

SWARM

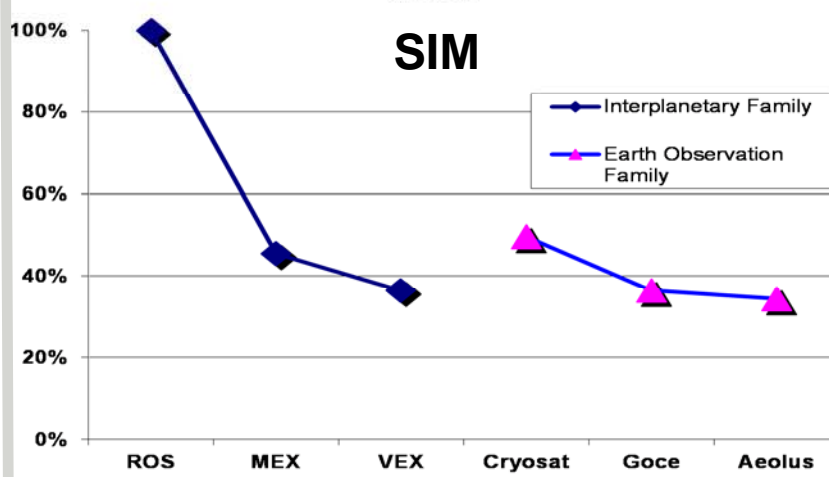
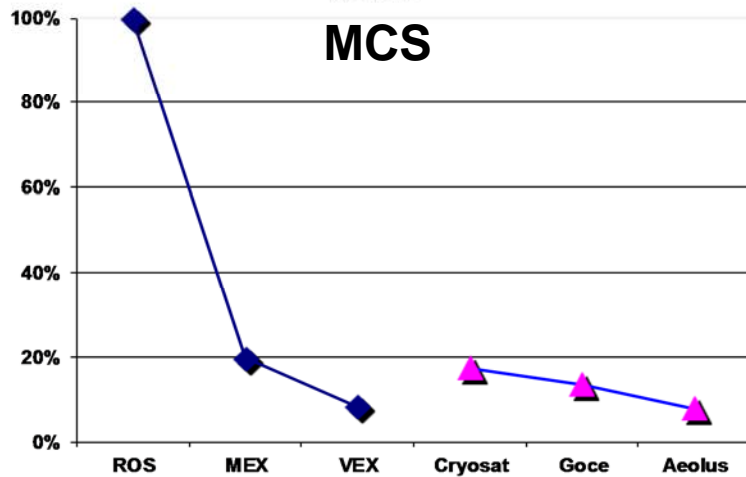
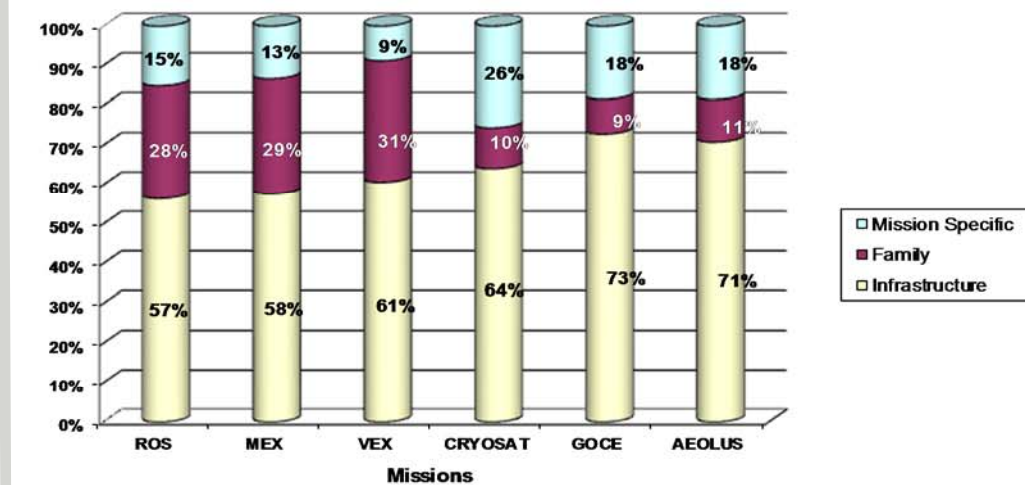
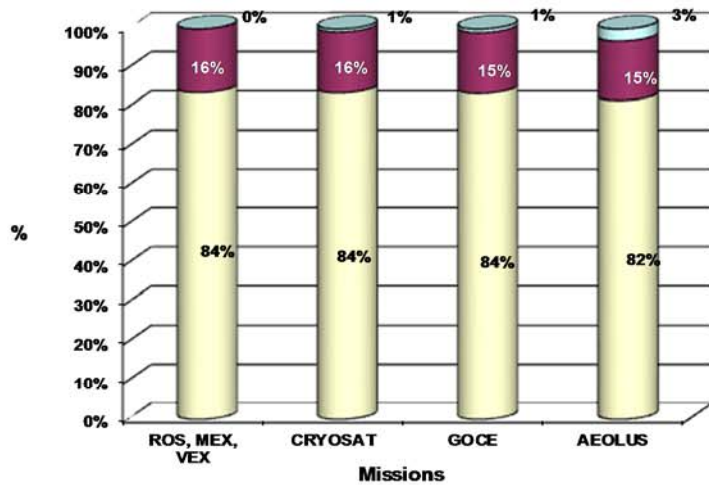
AEOLUS

- **16 spacecraft**
- **13 missions / different types**
- **1 Ground Network (ground antennae, communication network)**
- **1 Mission Operations Centre**
- **1 multi-mission Ground Data System**

Example of cost benefits in SW development through re-use



Requirement Reuse Development price



■ Mission Operations

- Mission Operations Concepts
- Spacecraft standardization
- Ground automation

■ Outsourcing

- Increase work subcontracted to industry
- Does it contribute to savings ?

■ Cloud Computing Technology

- Software installation
- Software maintenance
- Software migration

■ Open Source

- Share the burden of software product maintenance and evolution
- ESA Community Software License (based on OSS principles)
- Business oriented partnerships with industry

Thank you



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