



# Future European Magnetospheric Missions

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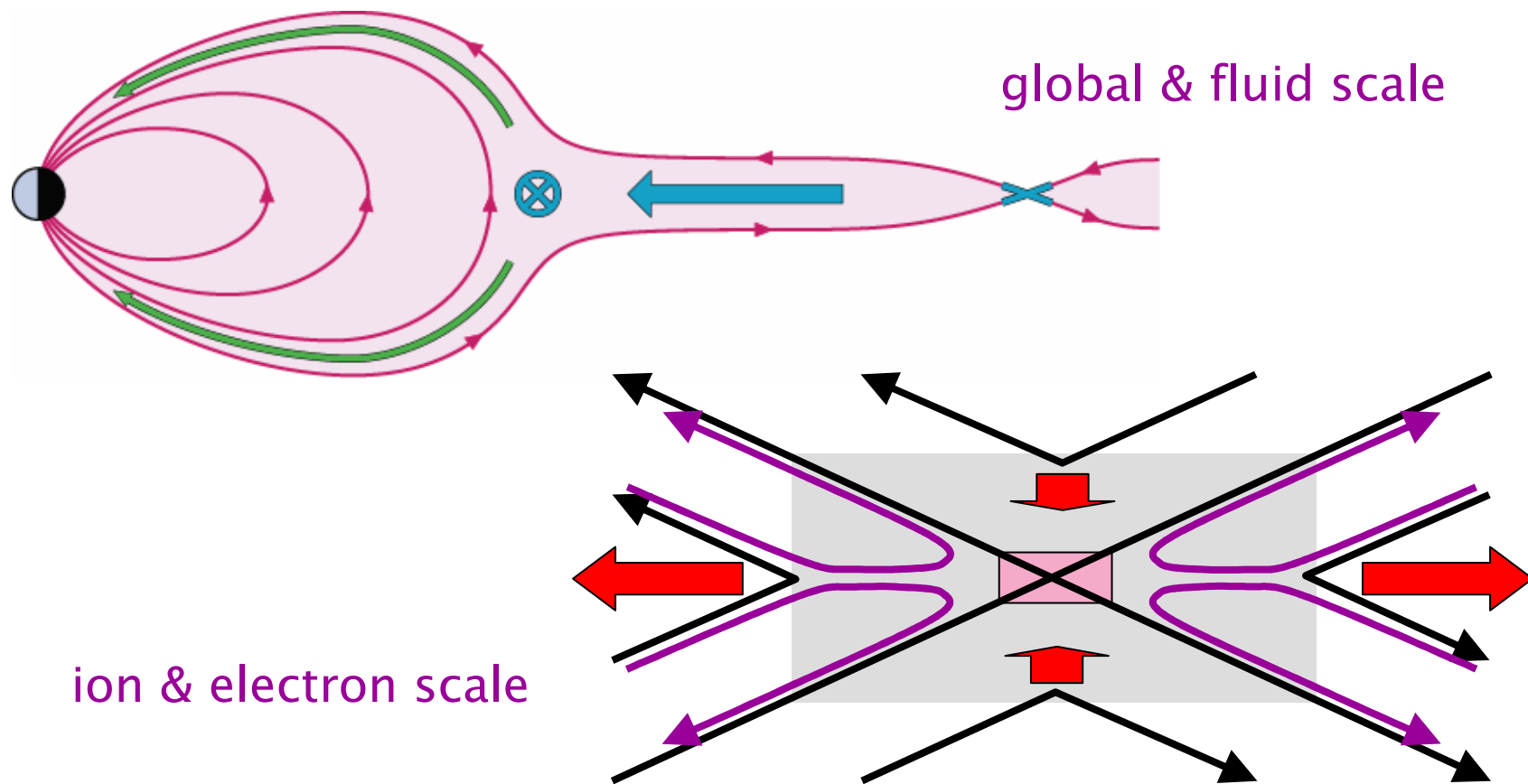
➤ *Thanks to: M. Fujimoto, P. Louarn, R. Nakamura, C. Owen, A. Roux*



# What do we know?



- Space plasma dynamics involves and is different on different scales: global scale, fluid scale, ion scale, electron scale
- Example: magnetotail reconnection involves 4 scales

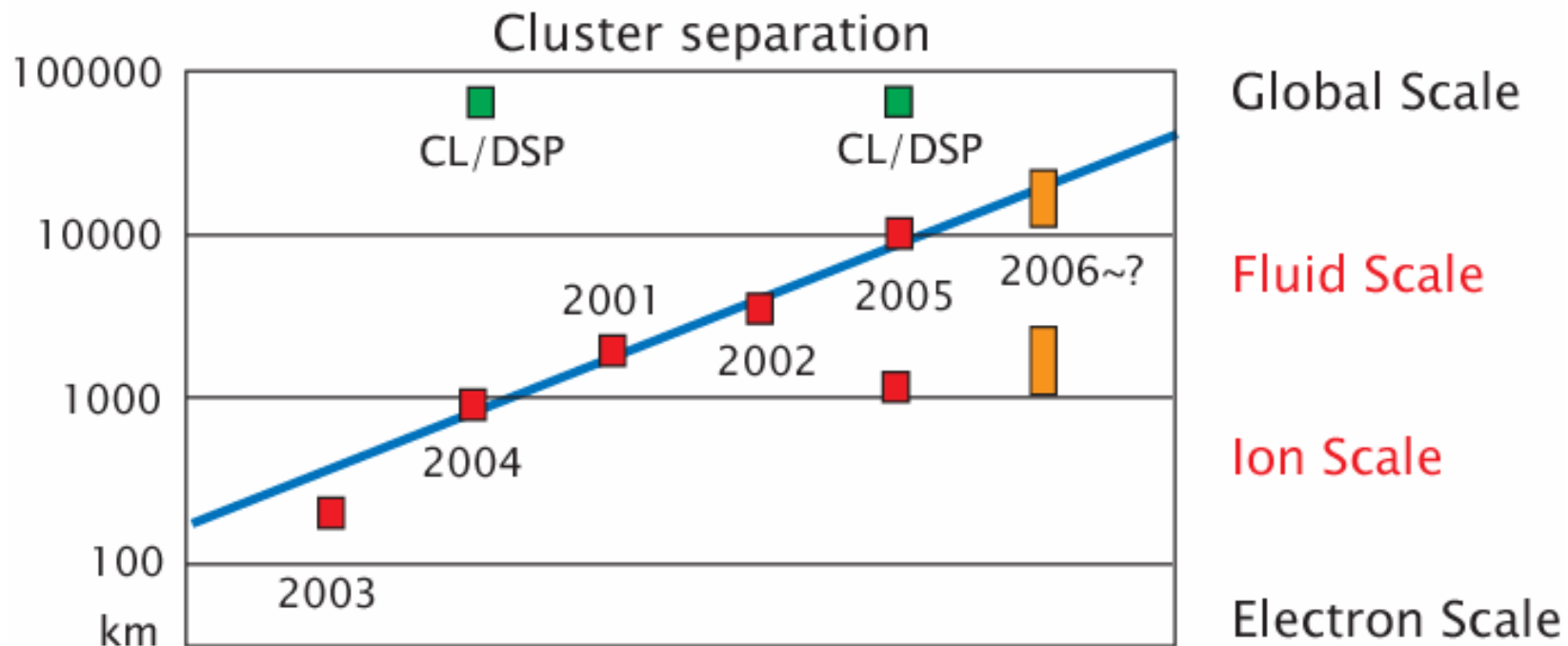




# Where are we?



- Geotail, Polar and others traversed fluid and ion scale
- Cluster tetrahedron **measured** on **fluid** and **ion** scale
- Cluster and Double Star together get **glimpse** on **global** scale

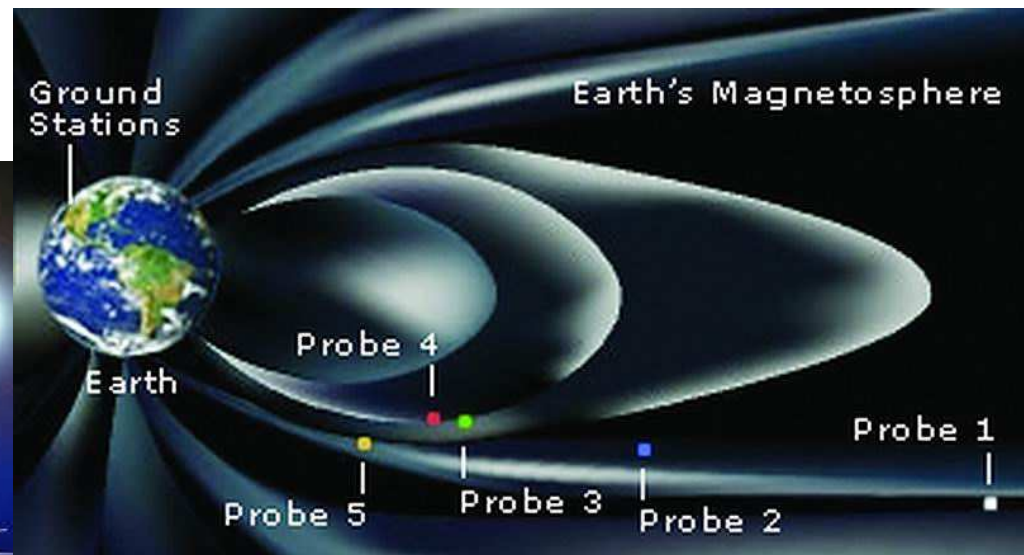
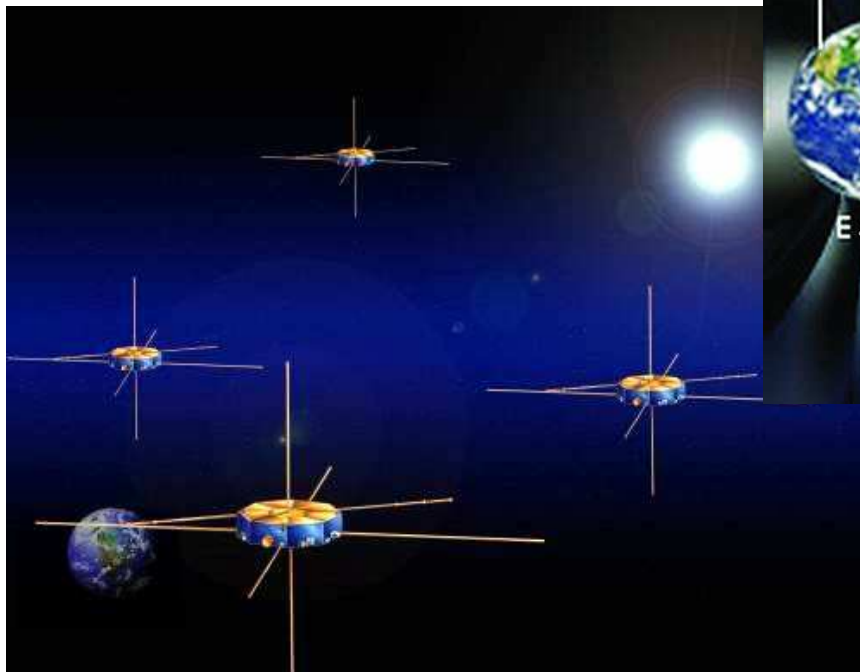




# What's next?



- Two NASA missions with large European contributions will probe the two remaining scales
- **THEMIS** (launch 2006) will probe **global** (and fluid) scale
- **MMS** (launch 2013) will probe **electron** (and ion) scale





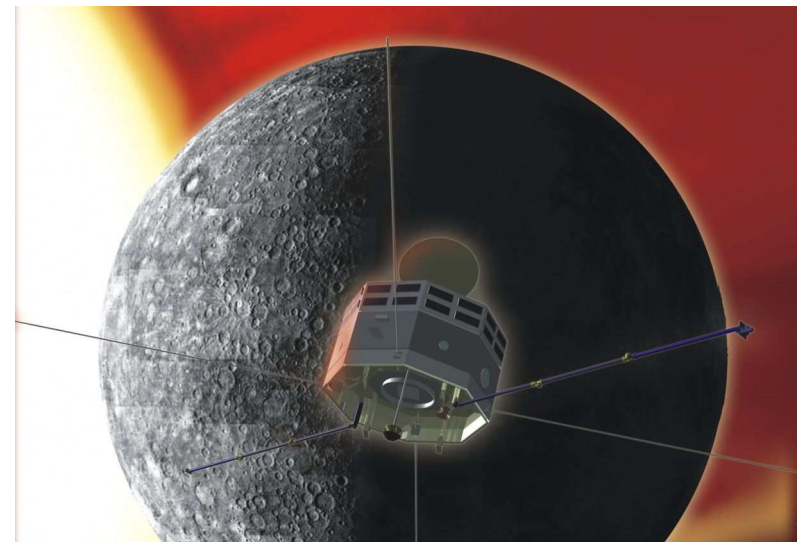
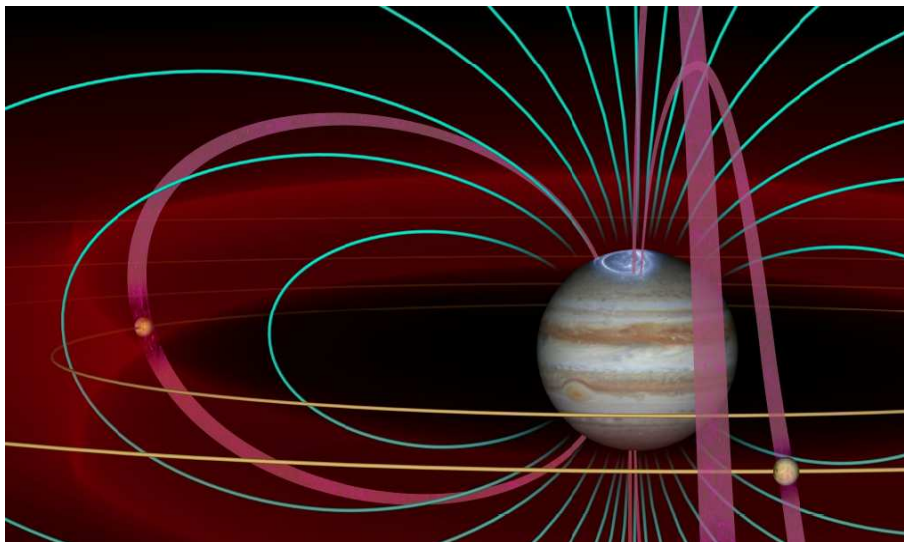
# Anything else?



- Observe other parameter regimes in other magnetospheres



- VEX (ESA 2005):  
plasma–neutral interaction
- BC (ESA/JAXA 2012):  
small m'sphere w/o ionosphere



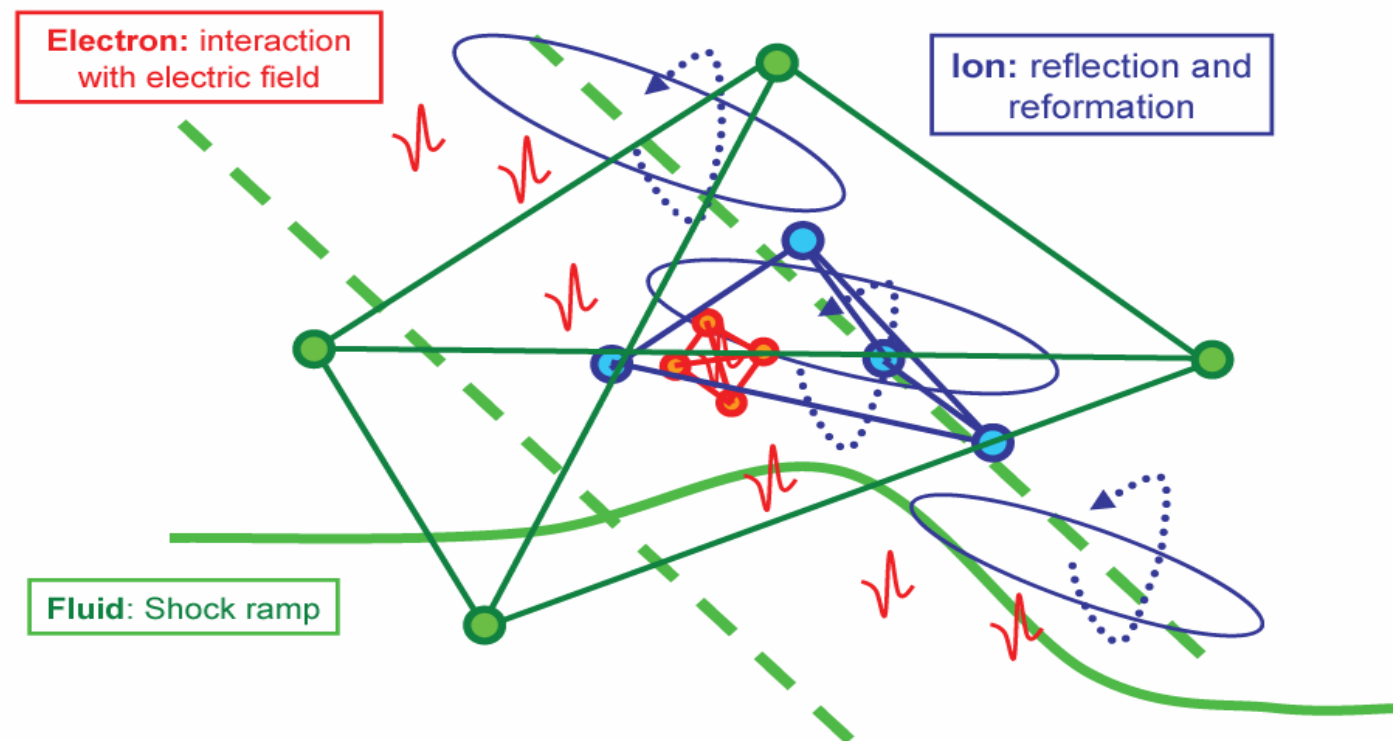
- JME (ESA? 2018?):  
rotation–dominated m'sphere



# Forgot something?



- Yes, something important: dynamics on **different scales couple**
- Example: **collisionless shocks** involve 3 scales



- Need to observe **different scales simultaneously**
- **Cross-Scale** (ESA/JAXA? 2015?) 10+ spacecraft for 3 scales