



NASA's future science needs in Antarctica and the Southern Ocean

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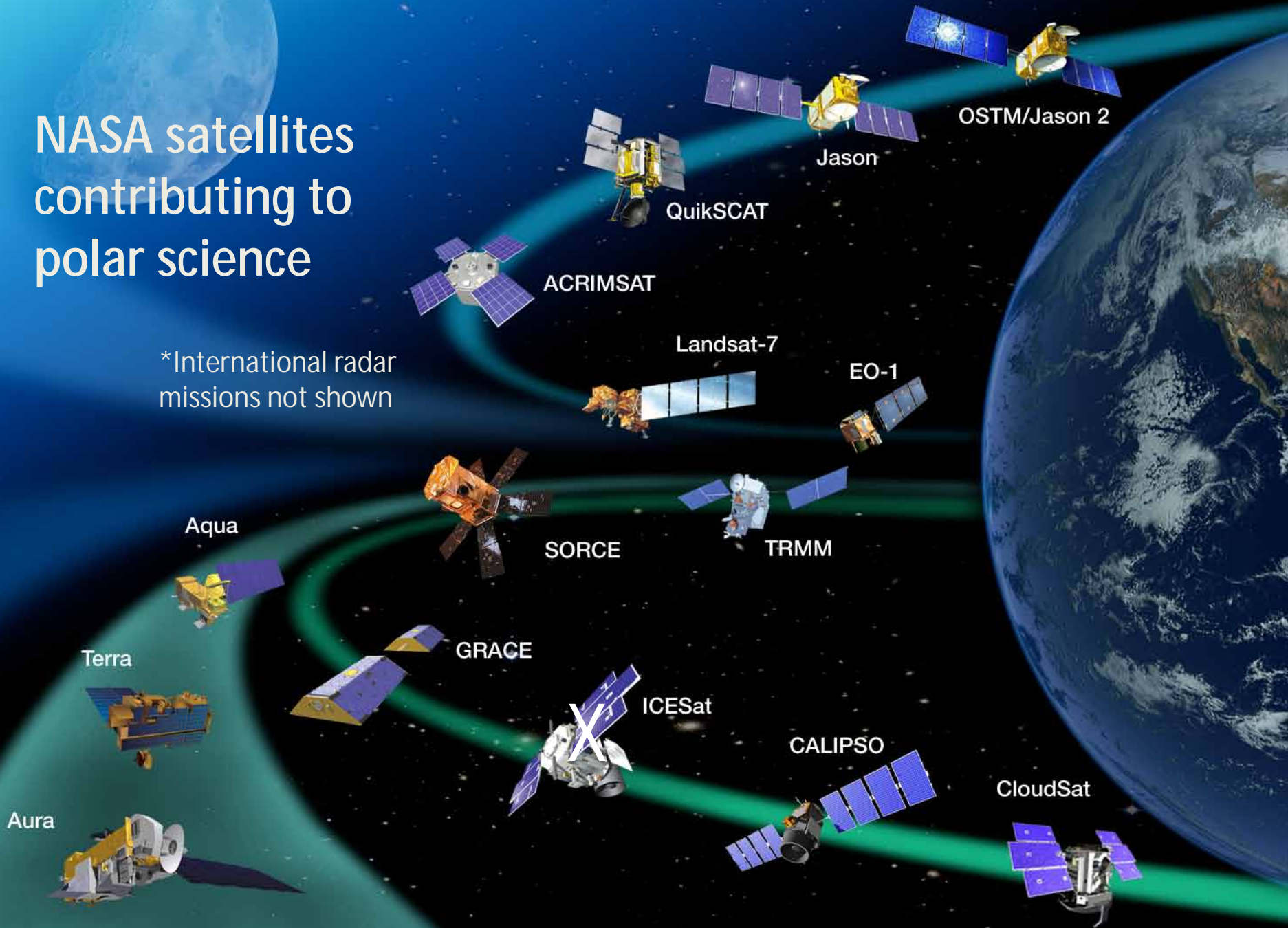
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NASA Scientific Interests In Antarctica

- Earth Science: Synthesis of satellite and aircraft observations for polar, climate, and earth system research: cryosphere, especially for sea level rise and sea ice change; oceanography; atmospheric science
- Planetary Science: Astrobiology; analogues, meteorites
- Heliophysics: Key observations from Antarctica
- Astrophysics: Scientific Balloon flights (working on capability for 100-day flights)
- McMurdo Ground Station: data downlink, launch control

NASA satellites contributing to polar science

*International radar missions not shown



OSTM/Jason 2

Jason

QuikSCAT

ACRIMSAT

Landsat-7

EO-1

Aqua

SORCE

TRMM

Terra

GRACE

ICESat

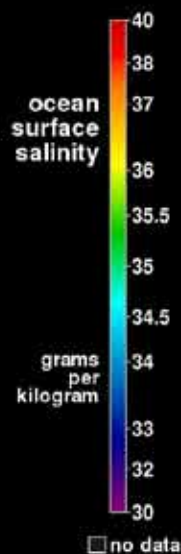
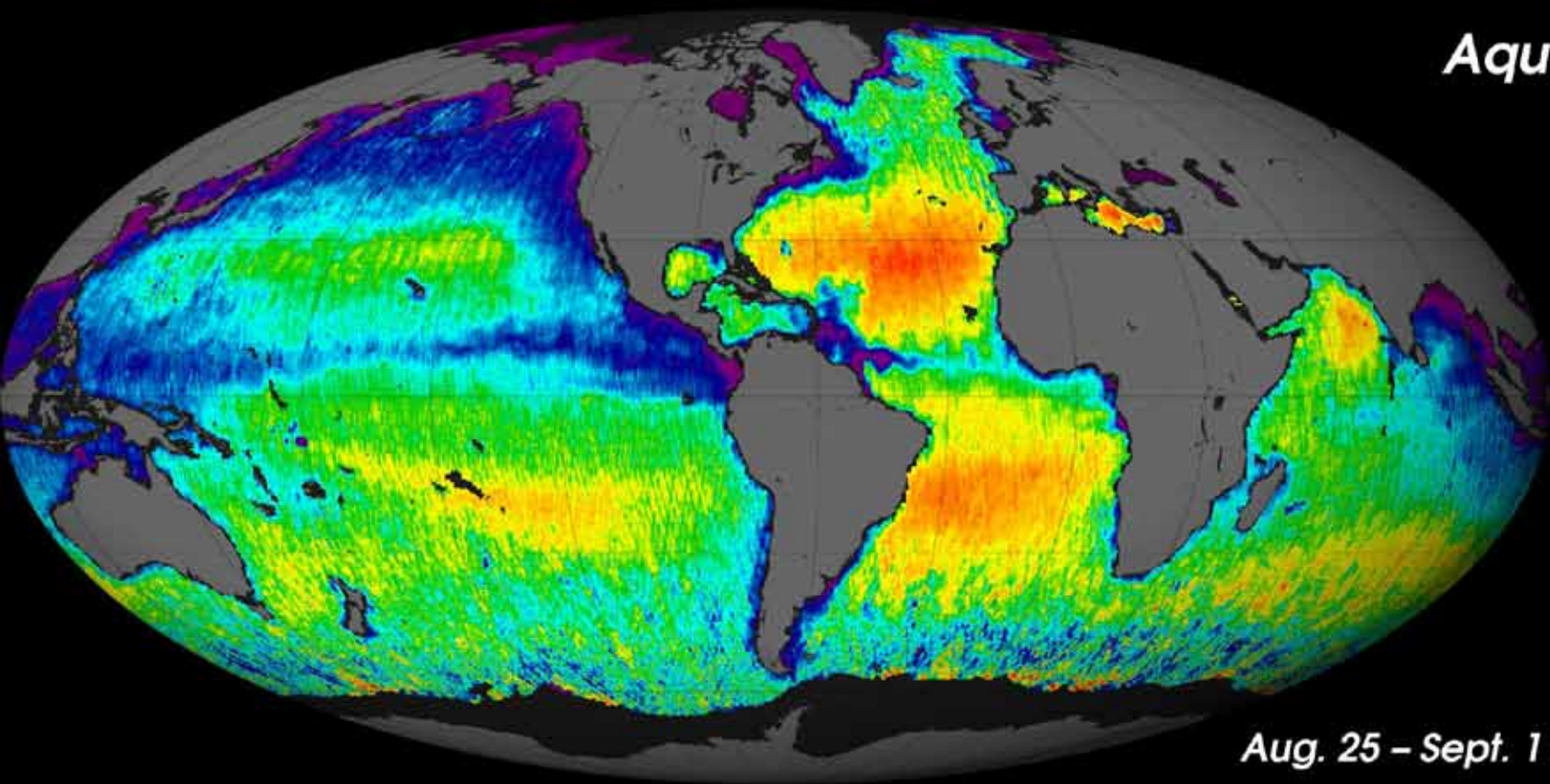
CALIPSO

Aura

CloudSat

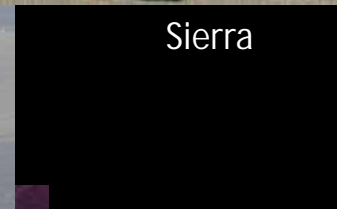


Aquarius



Aug. 25 – Sept. 11, 2011

NASA is developing UAVs and new instruments for polar science



UAVSAR: L-band airborne radar for topography, InSAR and other measurements; Ka band mapper

First results:
L-band image of Kangerlugssuaq ice fjord
Greenland, May 2009

New mission: IceBridge



Using aircraft to bridge gap in data collection between ICESat & ICESat-2; linking to CryoSat 2; making key measurements for predictive models involving ice

International

Australia, UK, France, Denmark

Antarctic campaigns completed in 2009 and 2010 over the Peninsula & East Antarctica

Instruments

Lidar

- ATM/NASA-GSFC
- LVIS/NASA-GSFC
- Photon counting/Sigma-U. Texas

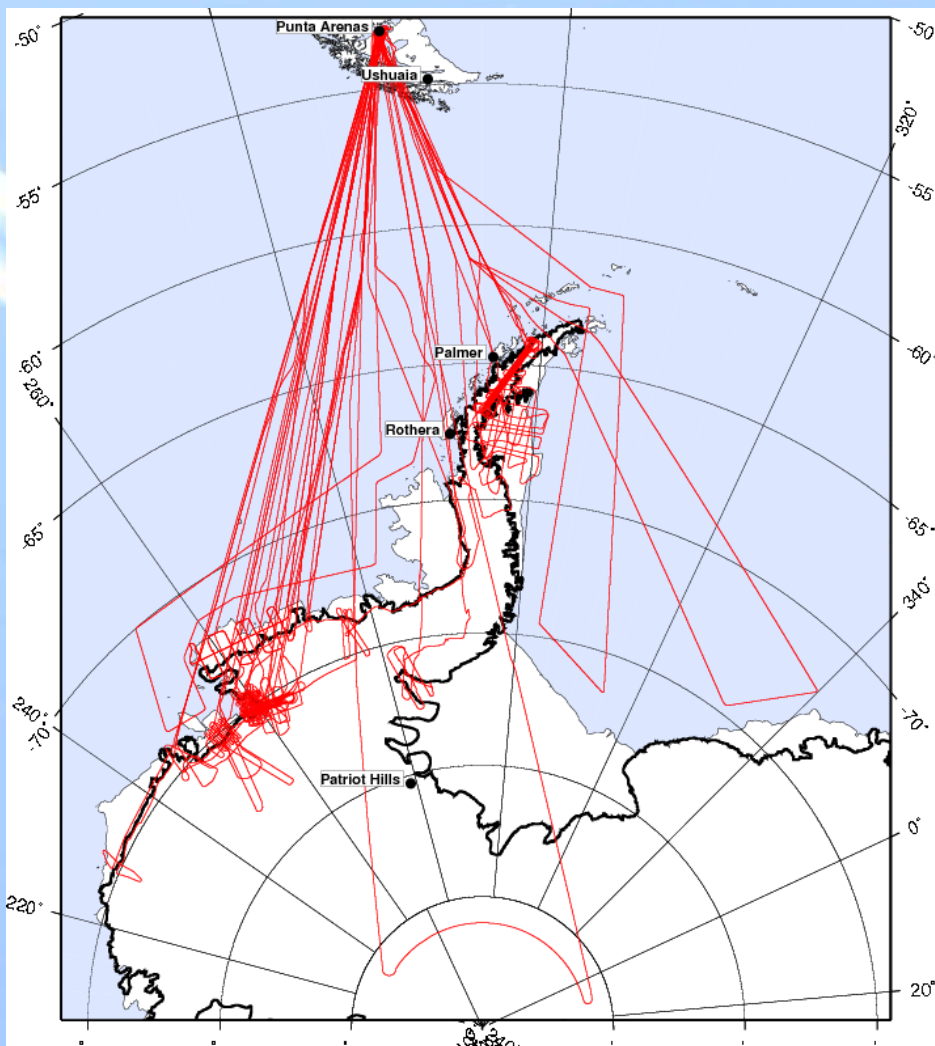
Radar

- Accumulation&snow radars/Kansas
- MCoRDS/U. Kansas
- HiCARS&WISE /U. Texas,-JPL

Gravimeter/LDEO & U.Texas

Magnetometer-U. Texas

DMS-High res camera/NASA ARC



Current Infrastructure Support

- NASA's activities utilize the full range of the Antarctic logistical support, though NASA is a small portion of their total use. That includes the Antarctic bases, aircraft, and on occasion ships
- Earth Science: satellite downloads and occasional launch guidance; additional data gathered by the USAP, such as the continental deformation measured by the POLENET GPS stations, the meteorological information and other information. For fieldwork, USAP aircraft and ground support are used
- Heliophysics and astrophysics: Housing, research lab support, aircraft recovery assets; establishment of launch site, transportation of personnel
- Planetary science: Deployment support for analog activities; aircraft deployment for meteorite collection

These needs will grow.

Challenges

- Competing Interests
- Limited Resources
- Inevitable Conflicts
- Deep Field Access

Needs and Opportunities for the Future

- Aircraft capabilities
 - Wheeled
 - Unpiloted Aerial Systems
- Integrated field campaigns
- Deep-field deployments
- Remote long-term observations

Systems Approach

- Challenges are interdisciplinary
- Antarctica as an element of the broader Earth system
- Linkages between ground, air, and space
- Comprehensive approach to specific questions
 - E.g. how will the interactions between ice, water, and bed influence future sea level rise
- The Antarctic Platform
- Infrastructure that supports these challenges