SMAP and Aquarius

Sea Surface Salinity Follow-on Data

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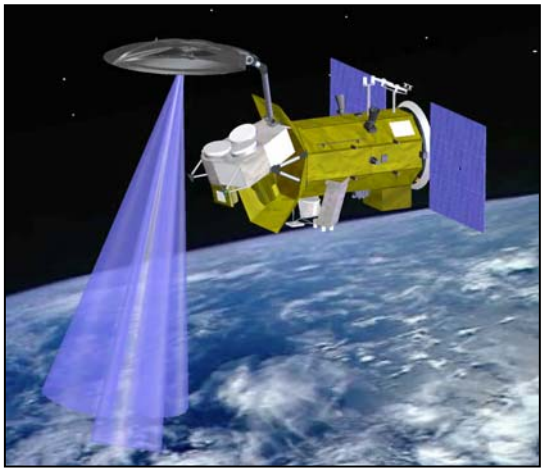
Outline

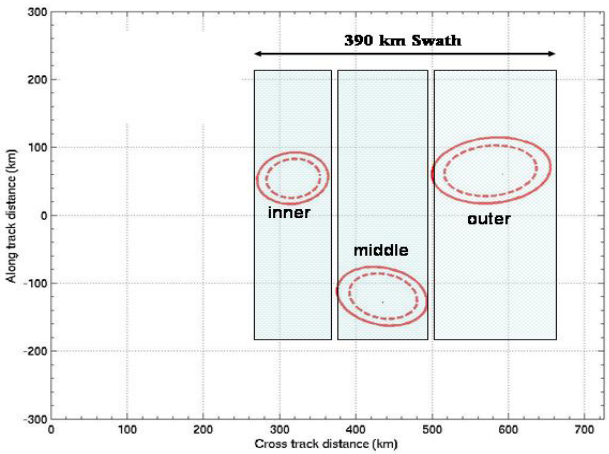
- **What SMAP can do for Salinity**
- **How Aquarius will help SMAP**
- **Background: Aquarius**

AQUARIUS
Sea Surface Salinity from Space

SMAP

AQUARIUS / SAC-D

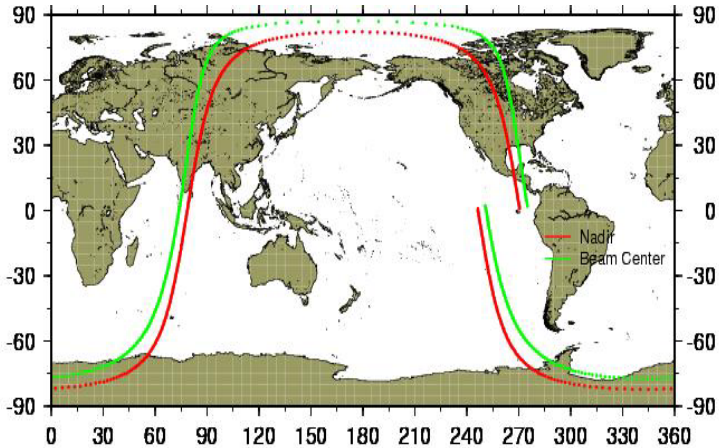


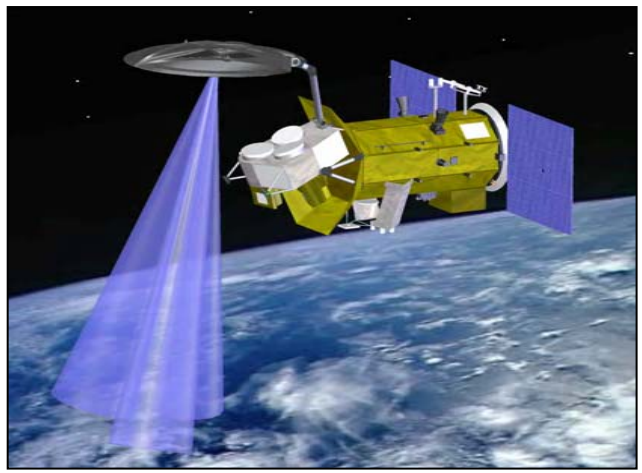


- ***Instrument***
  - ***L-band***
  - ***Radiometer and Scatterometer***
  - ***3 Beam Pushbroom***
  - ***Polarimetric (V, H and 3rd Stokes)***
- ***Mission***
  - ***Sun-synch orbit 6 am/6pm***
  - ***Night time look***
  - ***657 km Alt; 7 day revisit***
- ***Science***
  - ***Global maps of Sea Surface Salinity***
  - ***Accuracy: 0.2 psu; 150 km; monthly***
  - ***Seasonal and annual variations***
- ***Partnership***
  - ***USA/Argentina (NASA/CONAE)***
  - ***CONAE: Spacecraft (SAC-D)***
  - ***NASA: Aquarius instrument***
    - ***JPL: L-band scatterometer***
    - ***GSFC: L-band radiometer***

What Can Aquarius do for SMAP

- **Experience at L-band**
  - Data over land and ice
  - Faraday rotation correction
  - RFI level and mitigation
  - Sun (mean flux and flares)
- **Active/passive Combination**
  - Experience over land
- **Calibration target**
  - Well characterized ocean
  - Reference target for radiometer
- **CONAE instruments**
  - MWR: Radiometer at 23.8 & 36.5 GHz
  - NIRST: IR radiometer
  - Convert Tb → Emissivity

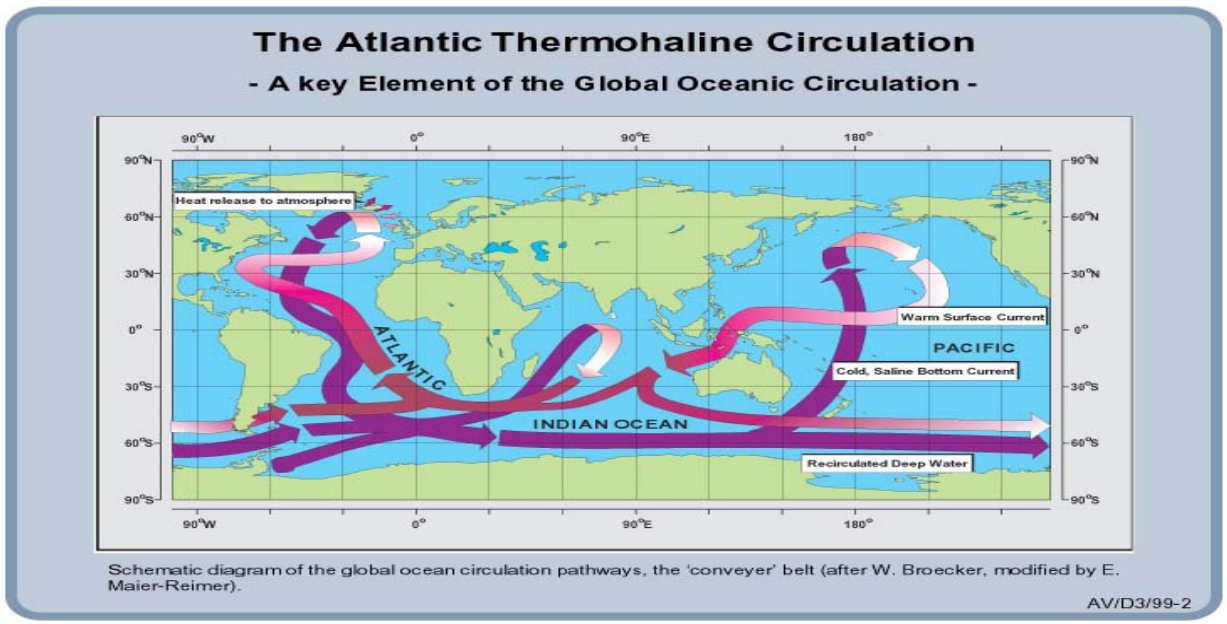




What SMAP can do for Salinity

Salinity Needed To

- Understand ocean circulation
  - Salinity (with temperature) determine water density
- Model heat exchange with the atmosphere
  - Salinity gradients cause stratification at the surface
- Monitor the water cycle
  - Salinity is a tracer for water flux (evaporation & water input)



What SMAP can do for Salinity

- **Improved spatial resolution**
  - Resolve mesoscale eddies, ocean fronts, subduction and upwelling zones
  - Better resolution near coastal and sea ice boundaries
- **Data Continuity**
  - Extended records to understand climate
  - Trends in the global water cycle and ocean circulation

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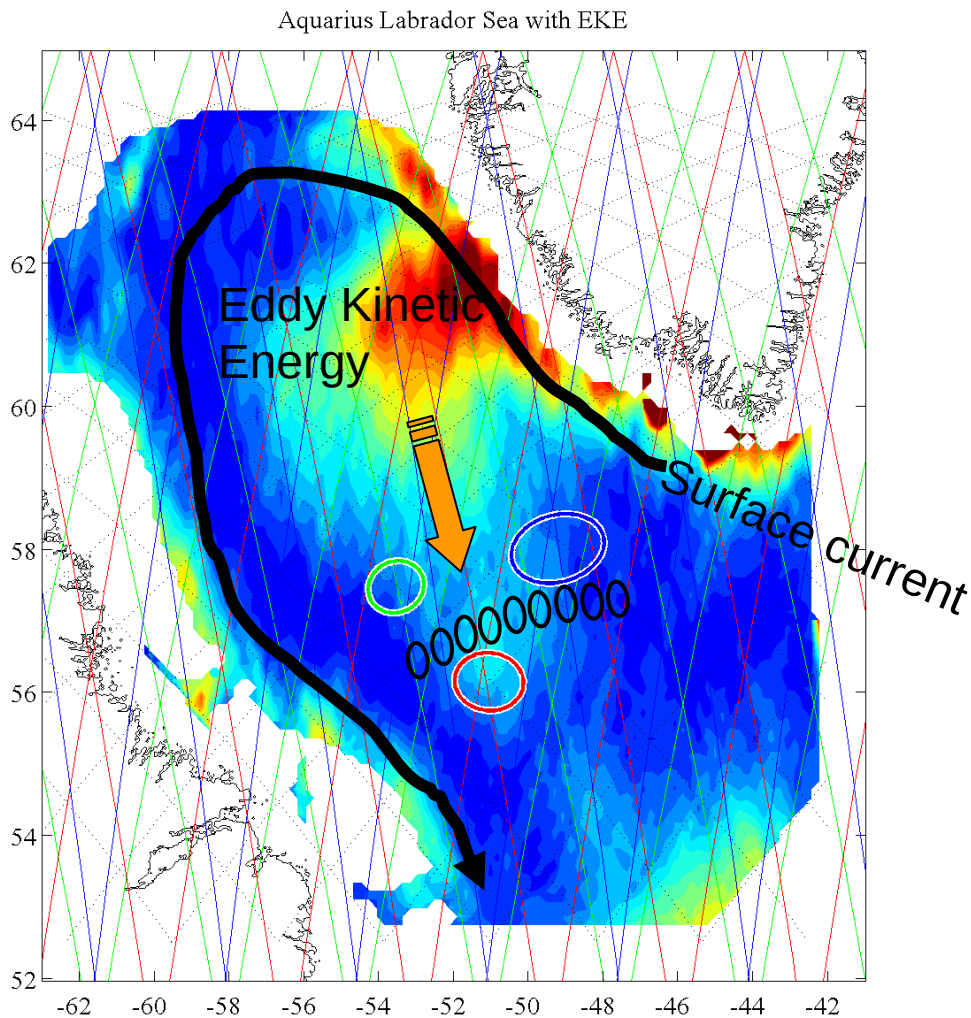
SMAP

Improved Spatial Resolution



Central Labrador Sea

- Key subduction region for the oceanic overturning conveyor circulation.
- Subduction rates are sensitive to surface salinity
- Salinity is influenced by the mechanisms that transport low salinity water near the coast toward the central region.
- These mechanisms are not well known and difficult to resolve with Aquarius resolution.

Conclusion

- **Aquarius will provide valuable precursor data for SMAP**
  - Passive/active data to enhance algorithms and science
  - Remote sensing experience at L-band to improve performance
    - RFI, Faraday Rotation, Calibration and Stability, etc
- **SMAP can enhance ocean salinity science**
  - Continuity of ocean salinity data
  - Improved spatial resolution
    - New insight into eddies and fronts
- **Technical challenges exist for achieving salinity accuracy**
  - Radiometer sensitivity and stability (0.1K)
  - Aquarius heritage and experience will be a valuable asset