# Aquarius: Active/Passive L-band Remote Sensing from Space.

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# Aquarius

- Combination active/passive L-band microwave instrument
- Primary goal is to map the surface salinity field of the oceans (will collect data over land)
- Part of the Aquarius/SAC-D mission
  - USA space agency (NASA)
  - Argentine space agency (CONAE)
  - Launch scheduled for May, 2010
- Aquarius will
  - Collect data continuously including over land and snow/ice
  - Provide the first simultaneous active/passive (radar/radiometer) data at L-band from space
  - Be a resource for transitioning from land/aircraft based observations of soil moisture to an active/passive L-band mission in space such as SMAP.

# Aquarius Instrument

## Orbit

Altitude: 657 km

Sun-synchronous

6 pm ascending

Inclination: 98 deg

## Antenna

Main Reflector: 2.5 m offset

3 beams: Swath = 390 km

Local incidence (deg)

28.7, 37.8, 45.6

Resolution (km)

76x94, 84x120, 96x156

## Radiometer

| | |
|---|---|
| Frequency | 1.413 GHz |
| Polarization | TV, TH, T3 |
| Sample interval | 10 ms |
| Integration time/sample | 9 ms |
| NEDT (5.76 sec) | 0.06K |
| Calibration Stability | 0.13K/week |

## Scatterometer

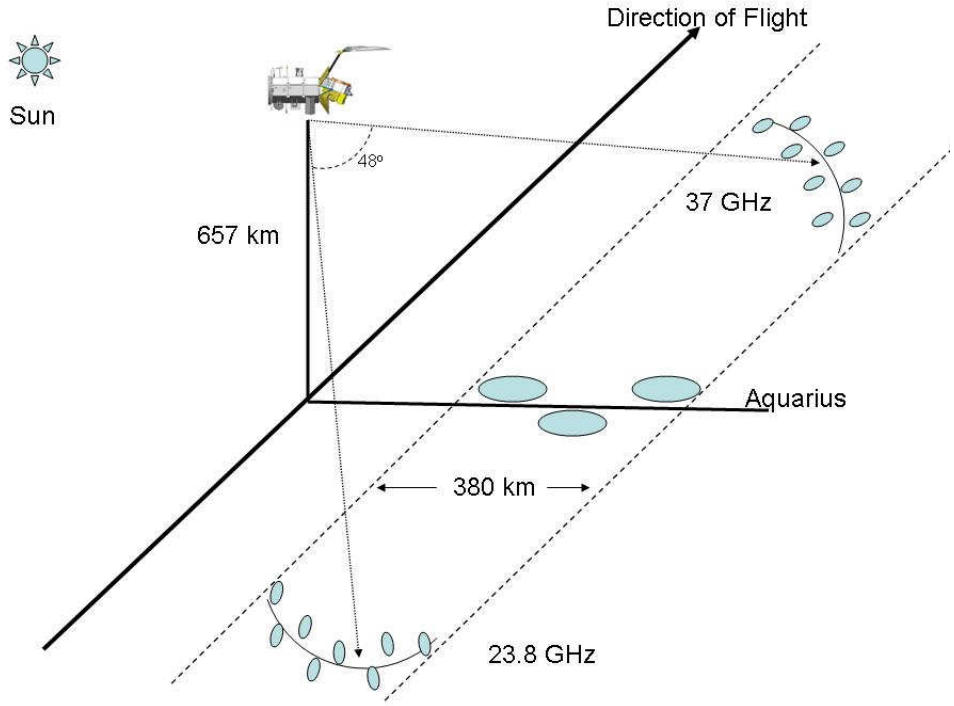
| | |
|---|---|
| Frequency | 1.26 GHz |
| Polarization | HH, VH, HV, VV |
| PRF | 100 Hz |
| Pulse width | 0.98 ms |
| Calibration | 0.1 dB |

# Observatory Instruments

| Instrument | Objective | Description | Resolution | Source |
|---|---|---|---|---|
| **Aquarius** | Sea Surface Salinity (SSS) | Radiometer (1.4 GHz)<br>Radar (1.26 GHz) | 76x 94 km<br>84x120 km<br>96x156 km | NASA |
| **MWR**: Microwave Radiometer | Precipitation; Wind speed; sea ice | 23.8 and 37 GHz<br>390 km swath | 40 km | CONAE |
| **NIRST**: New Infrared Sensor Technology | Fires, Sea Surface Temp | 3.8, 10.7, 11.7 μm<br>180 km swath | 350 m | CONAE |
| **HSC**: High Sensitivity Camera | Urban lights; Fire detection | 450-900 μm<br>700 km swath | 200-300 m | CONAE |
| **DCS**: Data collection System | Environmental data collection | 401.55 MHz uplink | 2 contact/day<br>200 platforms | CONAE |
| **ROSA**: Radio Occultation Sounder for Atmosphere | Atmospheric Temp & humidity profiles | GPS occultation | 300 km | ASI (Italy) |
| **CARMEN 1**: ICARE & SODAD | Effects of Radiation space μ-particles & debris | Si/LI detectors and SMOS sensors | | CNES (France) |

# Aquarius & MWR Imaging

- Cross track over-lapping swaths
- Aquarius:
  - 3 beams
  - Total swath of 300 km
- MWR:
  - 36.5 GHz (8 beams forward)
  - 23.8 GHz (8 beams aft)



# Opportunities for Soil Moisture

- New Observations from Space
  - L-band Passive/Active: Chance to evaluate new algorithms.
    - Active (radar): Validate theory and examine for new information
    - Passive (radiometer): Effect of topography, forest canopy at coarse resolutions
    - Active/passive: New algorithms that take advantage of synergy
  - Infrared and visible
    - Infrared: Concurrent surface temperature corrections for emissivity
    - Visible: Classification, fractional cover, and vegetation parameters
  - Microwave Radiometer (23.8 and 37 GHz)
    - Concurrent and coincident with L-band FOV
    - Effective temperature correction to estimate L-band emissivity
- Preparation for SMAP
  - First look at Active/Passive L-band from space
  - Evaluate algorithms and look for new synergy

# SMAP Follow-on of Aquarius

- SMAP data over oceans could benefit monitoring of the sea surface salinity field.
  - An obvious example would be continuity of the salinity data record.
  - Another contribution could come from the higher spatial resolution to be provided by SMAP (40 km).
    - With higher spatial resolution (than Aquarius), SMAP may provide additional information about mixing at ocean fronts, about subduction and upwelling zones, and information closer to the coast and sea ice boundaries.
    - An important example is the Labrador Sea, a source of cold water in the ocean thermohaline circulation, and a region with strong mixing where fresh water from coastal runoff meets saltier ocean water.

# May 2010