AQUARIUS INSTRUMENT AND SALINITY RETRIEVAL

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Aquarius has been designed to map the surface salinity field of the global ocean from space a parameter important for understanding ocean circulation and its relationship to climate and the global water cycle. Salinity is measured remotely from space by measuring the thermal emission from the ocean surface. This is done at the low frequency end of the microwave spectrum (e.g. 1.4 GHz) where the emission is sufficiently sensitive to changes in salinity to be detected with sophisticated radiometers. The goal is to monitor the seasonal and interannual variation of the large scale features of the surface salinity field in the open ocean by providing maps on a monthly basis with a spatial resolution of 150 km and an accuracy of 0.2 psu. These are challenging requirements that have led to some unique features of the instrument. These include: a) The addition of a co-located scatterometer to help provide a correction for roughness; b) The addition of a polarimetric channel (third Stokes parameter) to the radiometer to help correct for Faraday rotation; c) Asun-synchronous orbit with a 6 pm ascending equatorial crossing to minimize Faraday rotation and with the antennas looking away from the sun toward the nighttime side to minimize contamination by radiation from the sun; and d) An antenna designed to limit side lobes in the direction of rays from the sun. In addition, achieving the accuracy goal of 0.2 psu requires averaging over one month and to do this requires a highly stable radiometer.

Aquarius has three separate radiometers that image in pushbroom fashion with the three antenna beams looking across track. The antenna is a 2.5-m diameter, offset parabolic reflector with three feed horns and the three beams are arranged to image with the boresight aligned to look across track, roughly perpendicular to the spacecraft heading and pointing away from the Sun. The three beams point at angles of $\theta =$ 25.8°, 33.8° and 40.3° with respect to the spacecraft nadir which correspond to local incidence angles at the surface of 28.7°, 37.8° and 45.6°, respectively. The resolution of the three radiometer beams (axes of the 3dB ellipse) is: 76 x 94 km for the inner beam, 84 x 120 km for the middle beam to 96 x 156 km for the outer beam. Together they cover a swath of about 390 km. Aquarius will map the global ice-free ocean every

7-days from which monthly average composites will be derived. This will provide a snapshot of the mean field, as well as resolving the seasonal to interannual variations over the three-year baseline of the mission.