7.1 FIRST RESULTS FROM AMSR-E ON NASA'S AQUA SATELLITE

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1. INTRODUCTION

The Advanced Microwave Scanning Radiometer for the Earth Observing System (AMSR-E) was launched on NASA's Aqua satellite on 4 May 2002. AMSR-E was built by Mistubishi Electric Corporation (MELCO) with funding from Japan's National Space Development Agency (NASDA). It builds upon the heritage of the Special Sensor Microwave Imager (SSM/I) and Microwave Imager for the Tropical Rain Measuring Mission (TRMM TMI). AMSR-E was designed to retrieve information on a wide range of geophysical parameters, at unprecedented spatial resolutions in the microwave region, including sea surface temperatures through clouds, precipitation, soil wetness, sea ice and snow cover parameters, and oceanic surface wind speed, integrated water vapor, and integrated cloud water.

2. INSTRUMENT DESCRIPTION

AMSR-E (Fig. 1) is a conically-scanning passive microwave radiometer with a 1.6 m diameter parabolic reflector, illuminated by an array of six feedhorns. From an orbital altitude of 705 km, the instrument provides spatial resolutions ranging from about 5 km at 89 GHz to about 60 km at 6.9 GHz, a swath width of 1450km, and an Earth incidence angle of 55^o. Horizontally and vertically polarized brightness temperatures are measured at all frequencies (Table 1). A cold sky mirror and warm load calibration target provide a two-point linear calibration system at the cosmic background temperature (2.7 K) and at a thermostatically controlled temperature near 300 K, respectively. The warm target temperature is monitored with eight platinum resistance thermometers; six on the inside of the load and two on the surface The receivers are heterodyne, except for the 6.925 GHz channel, which is direct detection. Table 1 provides information about the individual channels of AMSR-E.

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3. AMSR-E NEW CAPABILITIES

The new capabilities provided by AMSR-E (over those of previous microwave imagers) are from the improved spatial resolution enabled by the 1.6 m diameter reflector, and addition of externally calibrated 6.9 GHz channels (and 10.7 GHz channels in a non-tropical orbit). The higher spatial resolution will allow improvements in most geophysical products. The addition of the low frequency channels permits global SSTs to be monitored through clouds. Both the combination of improved resolution and the low frequency channels allow significant advances in monitoring of soil moisture.

Fig. 1 AMSR-E main components.

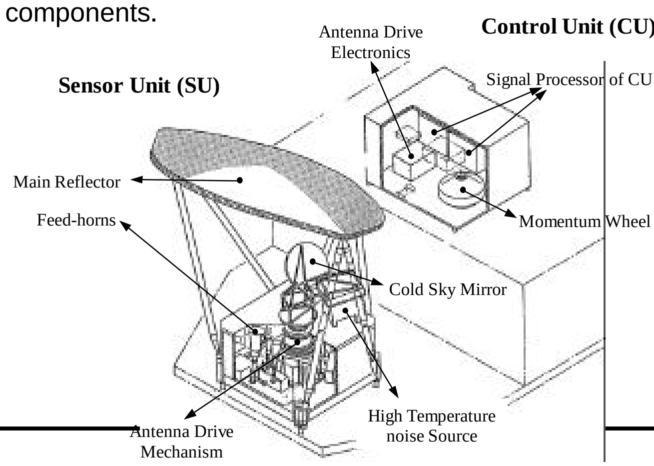
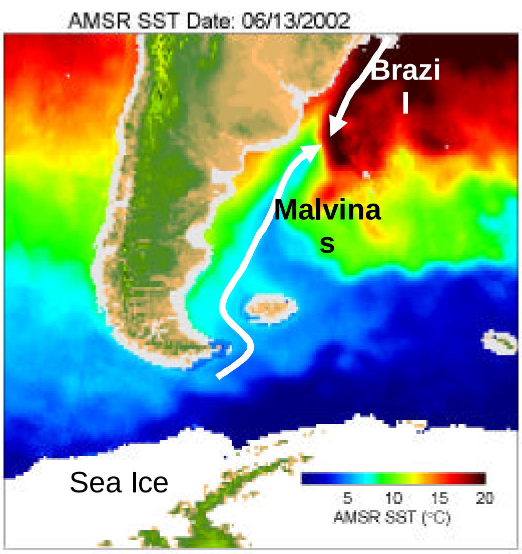


Table 1 AMSR-E channel frequency characteristics. All frequencies have H and V polarization channels.

Center Frequency (GHz)	RF Bandwidth (MHz)	Integration Time (ms)	Sensitivity (^{o}C)	IFOV (km)
6.925	350	2.5	0.34	43 x 75
10.65	100	2.5	0.7	27 x 48
18.7	200	2.5	0.7	16 x 27
23.8	400	2.5	0.6	18 x 31
36.5	1000	2.5	0.7	8 x 14
89.0 A	3000	1.5	1.2	4 x 6
89.0 B	3000	1.5	1.2	4 x 6

4. EXAMPLES

While additional examples will be presented at the conference, Fig. 2 shows sea surface temperature and surface wind retrievals from AMSR-E around southern South America (courtesy of Frank Wentz, Remote Sensing Systems). Fig. 3 illustrates the high spatial resolution of the 89 GHz channels of AMSR-E.



Air-Sea Interactions Revealed by AMSR-E

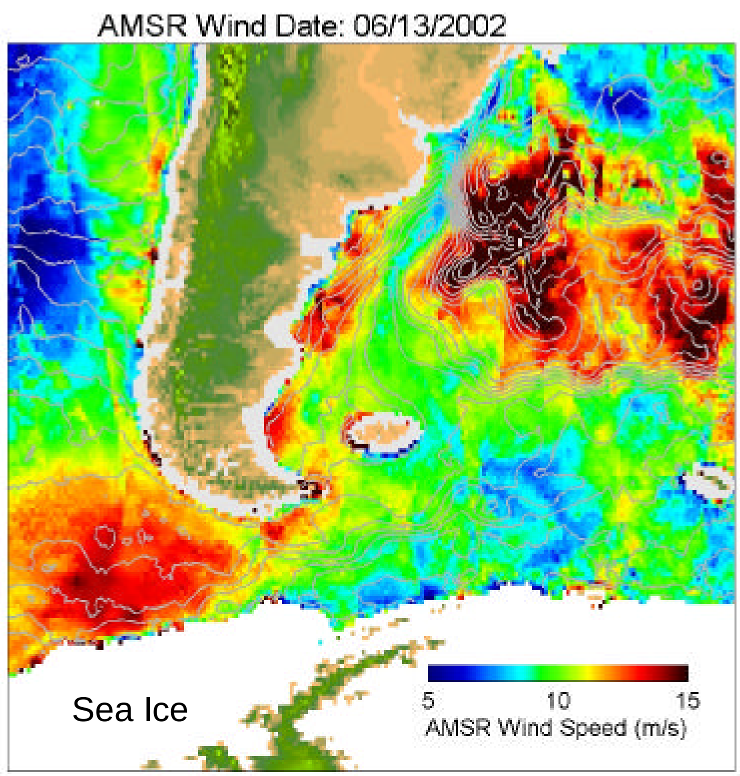


Fig. 2 Over the confluence of the Malvinas and Brazil Currents, the surface wind speed is modified by the sea surface temperature (SST). Over the cold Malvinas Current the wind speed is lower than over the warm Brazil Current waters. The image to the right shows the AMSR-E wind speed with SST contours superimposed.

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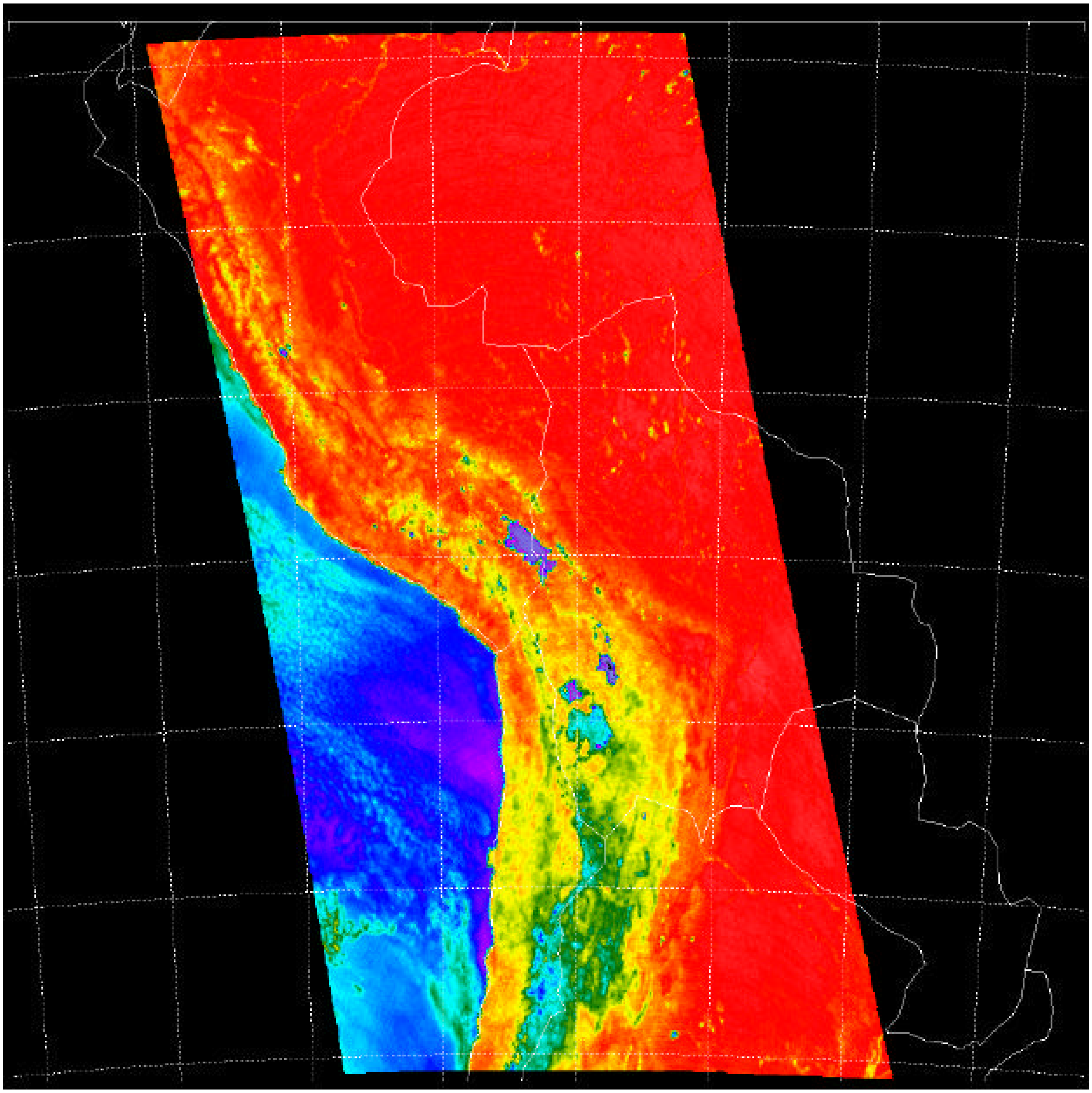

Fig. 3 AMSR-E 89.0 GHz imagery of western South America on 2 June 2002.