ERS Precision Orbit Determination and Accuracy Verification

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Development in the Earth's gravity field and ocean tide models, non-conservative force models, terrestrial reference frame definition, and precision orbit determination methodologies to employ dual-satellite altimeter crossovers, has enable the current radial orbit accuracy for ERS-1 and ERS-2 to approach the 5 cm rms level. These improved orbit determination methodologies enable an improvement in both the constant and the variable component of the ERS-1 and ERS-2 orbit error, and provide improved alignment of the absolute sea surface measurements from ERS within the terrestrial reference frame. Non-conservative forces are the current limitations for the ERS-1 orbit accuracy. The significant contribution by the global PRARE range and range-rate tracking measurements provides an improvement in the handling of non-conservative forces for ERS-2. In addition to crossover analyses, independently determined orbits were used to assess and verify the radial accuracy of the orbits. The orbit accuracy assessment also employed a technique which uses TOPEX/POSEIDON measurements for the characterization of the geographically correlated component of the gravity error in ERS-1 and ERS-2 orbits.