Geophysical Research Abstracts
Vol. 12, EGU2010-15625, 2010
EGU General Assembly 2010

Potential contribution to Earth System Science: Oceans and Cryosphere

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Measurements by satellites are critical in monitoring the state of the ocean and the cryosphere. However, observation limitations, knowledge gaps and deficiencies in quantitative understanding exist. These are, among others, related to mesoscale/submesoscale ocean dynamics, air-sea-ice interactions, coupled physical-biological processes, Arctic sea level change, sea ice rheology and deformation, permafrost changes, snow-water equivalent and global water cycle. Provision of reliable modeland data-based assessments and predictions of many of the elements of the state of the ocean and the cryosphere are consequently severely hampered.

The Sentinel-1 and -3 missions will ensure continuity and generation of longer time series (> 20 years) of data from synthetic aperture radar, altimetry, infrared radiometry and spectrometry. They will moreover sustain and strengthen the growing and important use of sensor synergy. As such advances in interpretation capabilities and development of physical-based retrieval methods are expected to strengthen ocean and cryosphere science. This may, in turn, benefit execution of existing services such as wave, oil spill and sea ice monitoring as well as stimulate new services for global monitoring for environment and security, for instance, regarding ocean swell tracking, eddy tracking, and extreme events of air-sea interactions.

The Sentinel-1 and -3 missions may also offer possible complementary use with Earth Explorer satellites such as the Cryosat, SMOS and GOCE missions, providing different and balanced observations. Expecting that data from the Sentinels are made easily available to the science community, the potential contribution of the Sentinel-1 and -3 missions to ocean and cryopshere science is therefore promising.