The NASA decadal survey aerosol, cloud, ecosystems mission

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In 2007, the National Academy of Sciences delivered a Decadal Survey (Earth Science and Applications from Space: National Imperatives for the Next Decade and Beyond) for NASA, NOAA, and USGS, which is a prioritization of future satellite Earth observations. The recommendations included 15 missions (13 for NASA, two for NOAA), which were prioritized into three groups or tiers. One of the second tier missions is the Aerosol, Cloud, (ocean) Ecoosystems (ACE) mission, which focuses on climate forcing, cloud and aerosol properties and interactions, and ocean ecology, carbon cycle science, and fluxes. The baseline instruments recommended for ACE are a cloud radar, an aerosol/cloud lidar, an aerosol /cloud polarimeter, and an ocean radiometer. The instrumental heritage for these measurements are derived from the Cloudsat, CALIPSO, Glory, SeaWiFS and Aqua (MODIS) missions.

In 2008, NASA HQ, lead by Hal Maring and Paula Bontempi, organized an interdisciplinary science working group to help formulate the ACE mission by refining the science objectives and approaches, identifying measurement (satellite and field) and mission (e.g. orbit, data processing) requirements, technology requirements, and mission costs. Originally, the disciplines included the cloud, aerosol, and ocean biogeochemistry communities. Subsequently, an ocean-aerosol interaction science working group was formed to ensure the mission addresses the broadest range of science questions possible given the baseline measurements,

The ACE mission is a unique opportunity for ocean scientists to work closely with the aerosol and cloud communities. The science working groups are collaborating on science objectives and are defining joint field studies and modeling activities. The presentation will outline the present status of the ACE mission, the science questions each discipline has defined, the measurement requirements identified to date, the current ACE schedule, and future opportunities for broader community participation.

Zircon trace element geochemistry from UHP to exhumation conditions, North-East Greenland Caledonides

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Trace element signatures of zircon from the Caledonian ultrahigh-pressure (UHP terrane) in North-East Greenland, collected at the USGS-Stanford SHRIMP-RG facility, change during exhumation to amphibolite facies conditions. Coesite-bearing UHP zircon shares features of eclogite-facies zircon with depleted heavy rare earth element (HREE) abundances, no negative Eu anomaly, and low Th/U ratios. The change from igneous to eclogite-facies metamorphic signature in protolith zircon is characterized by gradual depletion of HREE. Newly formed metamorphic rims have flat HREE patterns and REE concentrations distinct from the recrystallized inherited cores. This metamorphic signature is observed in coesite-bearing zircon formed at 354 ± 8 Ma, metamorphic rims formed at 348 ± 5 Ma during initial stages of exhumation, and metamorphic rims formed at 337 ± 5 Ma. Zircons from a garnet-bearing granite in the neck of an eclogite boudin have inner and outer cores with ages of 347 ± 2 Ma and 329 ± 5 Ma, respectively. Both domains are characterized by steeply sloping HREE patterns and a well developed Eu anomaly. Leucocratic dikes cross-cutting amphibolite-facies structural fabrics were emplaced at 337 ± 3 Ma, 330 ± 2 Ma, and 321 ± 2 Ma. All have steep HREE patterns but no Eu anomaly and very low Th/U. Hornblende-bearing granitic leucosome zircons record a progression in ages from 330 to 320 Ma associated with steepening of the HREE and emergence of a negative Eu anomaly due to involvement of garnet and feldspar during amphibolite facies retrogression and a later, well defined drop in MREE reflecting co-crystallization with titanite. The trace element signature of zircon is dependent on the elemental availability either through breakdown reactions (e.g. quartzofeldpathic gneiss and leucosome), presence of exhumation-related melt, and/or fluid influx (e.g. boudin neck pegmatites and leucocratic dike). The use of the trace element signatures in zircon may therefore vary in its ability to track the exhumation history of UHP terranes as a function of sample lithology.