Geophysical Research Abstracts
Vol. 13, EGU2011-4551, 2011
EGU General Assembly 2011

Integrated water resources management in Small Island Developing States: managing ENSO climate variability, agricultural intensification and economic development

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Nowhere is the balancing act between economic prosperity, environmental sustainability, and managing attendant climate change related pressures, as acute and interlinked as on Small Island Developing States (SIDS). SIDS are vulnerable due to their small size in both biophysical and socio-economic senses and isolation, as well as by limited human, financial and natural resources bases. Present problems resulting from increased water demand and pollution of water may be more significant than anticipated effects of climate change. SIDS are increasingly confronted with the environmental consequences of utilizing their fragile natural resources for economic development.
Integrated water resources management is necessary to maintain crucial ecosystems services while increasing the buffering capacity of natural and agricultural systems against climate-variability related events such as droughts and floods. Importantly, for islands influenced by the El Nino Southern Oscillation (ENSO), opportunities exist for using climate information for better management of water resources. For example, on Tongatapu (area 260 km2), a raised coral atoll in the Pacific Ocean, freshwater resources occur mainly as lenses floating on salt water underneath the island. Rainfall is collected in tanks and water is pumped from wells for domestic, agricultural and industrial uses. Dry El Nino years and wet La Nina years determine inter-annual water availability and rainfall recharge of the subterranean freshwater lenses. Temporal fluctuations in salinity of the pumped wells indicate that ENSO events cause large variations around mean salinity thus controlling the relative salinity over the time-scale of several years. Smaller variation is caused by seasonal rainfall. Furthermore, the Southern Oscillation Index can be used to predict pumped freshwater salinity with a lag time of 10 months.
We will illustrate the dilemmas and opportunities of SIDS with several concrete examples from Pacific and Caribbean islands.