UNIVERSITY of HAWAI'I MĀNOA

Department of Atmospheric Sciences Seminar Announcement

Department of Atmospheric Sciences, **S.O.E.S.T.,** University of Hawai'i at Mānoa
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SCHOOL OF OCEAN AND EARTH SCIENCE AND TECHNOLOGY

The Impacts of Sahara greening on the West African Monsoon and its teleconnections to ENSO variability and storm activity during the African Humid Period

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Date: **Tuesday, July 11, 2017**
Refreshments: **Free Cookies, Coffee & Tea Provided (Please Bring Your Own Cup)**
Seminar Time: **11:00am**
Location: **IPRC Conference Room, POST 414**

Abstract:

One of the most dramatic changes in the West African Monsoon (WAM) occurred between 15000–5000 yr BP, when increased summer rainfall led to the so-called "Green Sahara" and to a reduction in dust emissions from the region. However, model experiments are unable to fully reproduce the intensification and geographical expansion of the WAM and the reduced El Nino-Southern Oscillation (ENSO) variability during this period. Here, we use a fully coupled simulation for 6000 yr BP (Mid-Holocene) in which prescribed Saharan vegetation and dust concentrations are changed in turn. A close agreement with proxy records is obtained only when both the Saharan vegetation changes and dust decrease are taken into account. The dust reduction strengthens the vegetation–albedo feedback, extending the monsoon's limit approximately 500 km further north than the vegetation-change case only (to about 30°N). Accounting for a vegetated and less dusty Sahara also has teleconnections far afield. We show that the strengthening of the WAM is able to affect ENSO variability, reducing it by 25%, more than twice the decrease obtained using orbital forcing alone (10%). We identify changes in tropical Atlantic mean state and variability as fundamental agents driving ENSO variations. The momentous strengthening of the West Africa Monsoon (WAM) simulated under vegetated Sahara leads to an Atlantic Niño-like mean state and a reduction of its variability (46%). These changes in the equatorial Atlantic, in turn, affect the ENSO behaviour over the Pacific through changes in the Walker circulation.

The above-mentioned changes in the large-scale circulation and the thermodynamical and kinetic state of the atmosphere have also strong impacts on tropical cyclone (TC) development worldwide. Our results show that the greening of the Sahara and its associated reduction in dust emissions leads to an increase of TC activity in both hemispheres, particularly over the Caribbean Sea, Gulf of Mexico and east coast of North America.

Overall, our studies highlight the importance of Saharan vegetation and dust emission in altering not only the intensity of the WAM, but also ENSO variability and the potential intensity and genesis of TCs.