

SIAM MPE Community Meetings: Inaugural Colloquium

Dr. Antonio J. Busalacchi

President, University Corporation for Atmospheric Research (UCAR), Boulder, CO

The Future of Forecasts: Earth System Prediction in the 21st Century

Abstract: Coming out of WWII, our knowledge of the physics and dynamics of the atmosphere together with the advent of digital computing ushered in the present era of numerical weather prediction. Today, we find ourselves at a similar juncture. Decades of observations from the Earth Observing System, related understanding of Earth System Science and Earth as a coupled system, combined with the prospect of exascale computing, have placed us on the cusp of a new era of Earth System Prediction. At the other end of the temporal spectrum far away from day to day weather prediction, climate change projections from decades to centuries have served as the basis for policy decisions on how best to respond to ever increasing levels of greenhouse gases. In between weather prediction and climate change projections is a spectral gap of subseasonal to decadal in which numerous infrastructure, investment, and policy decisions are made. Society requires expanded prediction capabilities and future environmental products beyond the bounds of weather prediction for areas such as coastal oceans, marine and terrestrial ecosystems, agriculture, air and water quality, regional CO₂ and other chemical constituents, and environmental health parameters. Development of an environmental prediction capability will require incorporation of additional components of the Earth System beyond the physical climate system such as biological properties of terrestrial and ocean ecosystems and an assessment of the limits to their predictability. The core elements and expertise needed in this regard include atmospheric general circulation models, ocean circulation models, land surface models, interactive vegetation models, marine ecosystem models, atmospheric chemistry models, global carbon cycle models, assimilation techniques for atmosphere-ocean-land, population dynamics, crop models, infectious disease models and modules to name a few. The challenge now is to bring these core elements together within a common infrastructure and with a central focus on subseasonal to decadal prediction of the Earth System in the broadest sense. Furthermore, the prospect of Earth System prediction has unique policy relevance at both the national and international levels with respect to agriculture, hydrology, ocean resources, energy, transportation, commerce, health, and global security

Biography: Dr. Antonio J. Busalacchi became president of UCAR in August 2016. An expert in Earth's climate system and ocean-atmosphere interactions, he helps guide NCAR's world-leading research into the Earth system sciences and its support of the research community through supercomputing, observing instruments, and community models.

Thursday, Oct. 26, 2023

11:00 AM EDT

Zoom link: siam.zoom.us/j/81561821731

Host:

Pierre Lermusiaux

<http://mseas.mit.edu>

Data Assimilation
Adap
Mode
Blended Estimates

Stoch. Coef. 4

0.62
0.41
0.21
min 2

$\frac{\partial \phi_i}{\partial t} + \mathbf{u} \cdot \nabla$

Chl.
Fcst.

n (dB)

Receivers
(A)

Loss)

40

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