Digital Earth
WCRP Lighthouse Activity -
An Update

Andrew Gettelman, NCAR
Christian Jakob, Monash Univ
Andreas F Prein, NCAR
Aneesh Subramanian, U Col
Cathy Hohenegger, MPI

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Digital Earth LHA Goal

Support and coordinate the research underpinning the establishment of integrated interactive digital information systems that provide global and regional information on the past, present, and future of our planet and our human systems
What is most needed to pull this off?

1. **Fully coupled km-scale regional and global models**: Need a global research network with expertise in km-scale modeling of the Earth system and its individual components.

2. **Data assimilation for climate**: Establish an active research community in data assimilation for climate that builds on the existing numerical weather prediction and re-analysis efforts and significantly expands them.

3. **Beyond the Physical Earth System**: Incorporate human interactions on and impacts to human systems in the information system workflow.

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1. **Regional and Global Coupled Km-Scale Modeling** (Lead: Cathy Hohenegger, MPI-M)

   1. **Data Assimilation for Climate** (Lead: Aneesh Subramanian, Univ. Colorado)

   1. **Beyond the Physical System: Linking to society**
Activities

1. Regional and Global Coupled Km-Scale Modeling (Lead: Cathy Hoehenegger, MPI-M)
   - Workshop planned for October 3-7, Boulder, CO
   - Joint with ESMO
   - [https://www.mmm.ucar.edu/events/2022/wcrp](https://www.mmm.ucar.edu/events/2022/wcrp)
   - White paper planned

2. Data Assimilation for Climate (Lead: Aneesh Subramanian, Univ. Colorado)
   - Workshop held in May
   - Joint with Explaining and Predicting Earth System Change LHA
   - White paper under construction

3. Beyond the Physical System: Linking to society
   - Started discussions with GEWEX, US-RHP proposal and ISIMIP
   - Aiming to establish one or more demonstration project(s)
A global-regional modeling alliance

Goals

• Define several demonstration projects converging diversity of regional foci, and regional-global dependencies

• Build scalable modeling and workflows that can facilitate transition from regional to global modeling and vice versa

First steps

• Launch some common projects – for example pick some regions and periods and analyze global and regional simulations together.

• Organize a workshop dedicated to the development of regional Digital Earths systems?

• Create WCRP-wide Task Force that identifies opportunities for the application of Digital Earths outputs and propose demonstration projects for their potential utility?
Data assimilation for climate workshop

- May 19-20 workshop, Boulder, CO (after US CLIVAR Meeting)

- Covered 5 topics:
  - Initialization and calibration for prediction
  - Reconciling climatology of observation constrained reanalysis and free running models
  - Uncertainty in the mean state and the climate trend in reanalysis products
  - Closing budgets and representing climate trends in reanalysis
  - Reducing model error (in both climate projection and reanalysis modes) by confronting models with observations using DA formalism
Beyond the Physical Earth System

Goals

• Target adding of new components to traditional ESMs, all the way from detailed hydrological models to water and land management models to socio-economic impact models.

• Establish a physical-impact science alliance that enables the co-design of physical Earth system approaches and that defines and implements success metrics in the use of Digital Earths systems by society.

What has happened?

• Started discussion with the US RHP proposal team – Lots of interest but funding for RHP is not secured. Collaboration across funding agencies is likely required to succeed.

• Contacted ISIMIP (Inter-Sectoral Impact Model Intercomparison Project) - A Gettelman to attend parts of their 16-19 May workshop
Challenges

1. Regional and Global Coupled Km-Scale Modeling

2. Data Assimilation for Climate

3. Beyond the Physical System: Linking to society

• Our biggest challenge is to engage the community:
  • Modelling community is divided in its view on the value of ultra-hi-res modelling. Those in favour forge ahead without us. Those opposed are not keen on engaging.
  • DA for climate community is only emerging and small.
  • Impacts community is not yet engaging with the DE vision
• Propose to restructure LHA leadership by inviting active Centres/Groups to nominate a representative (a la WGNE, WGCM)
  • This will ensure a strong connection to the leading efforts around the world.
How can the JSC help?

1. Regional and Global Coupled Km-Scale Modeling
   - Data Assimilation for Climate

2. Beyond the Physical System: Linking to society
   - 1. Data Assimilation for Climate

3. Spread the word and be positive!
   - Advertise our activities in your networks.
   - Help us make connections.
   - Identify opportunities for joint activities to reduce number of acronyms and workshops.
   - Ideas, ideas, ideas …