

Summary of “Evaluation of Reanalyses – Developing an Integrated Earth System Analysis (IESA) Capability”

Day 1: Overview and assessments of ongoing activities

Kevin Trenberth	Atmospheric Reanalyses
Michele Rienecker	Ocean Reanalyses
Mike Bosilovich	MERRA (NASA)
Bob Kistler	CFS-R (NOAA/NCEP)
Gil Compo	Historical Atm. Reanalysis (ESRL)
Ben Geise	Historical Ocean Reanalysis
David Bromwich	Arctic System Reanalysis
Ebita Ayataka	Japanese Reanalysis – JRA 55

Observational Data Recovery/Bias Correction

Russ Vose	Atmospheric Data Recovery
Jim Carton	Observational Bias - Ocean

Day 1: Key Points

- **Over the past decade there have been major advances in atmospheric and ocean reanalyses.**
- These advances should substantially increase the value of reanalyses for research and applications
- The relative proliferation of recent reanalyses poses challenges, but also opportunities. For example, intercomparisons can pinpoint areas of major differences where model/OS improvements are needed
- Multiple streams of reanalysis are being pursued. They address varying needs, from the longest feasible period to shorter-term reanalyses focused on improving operational predictions.
- Data recovery and reductions in observational bias (data homogenization) are crucial to the ultimate quality of reanalyses. **There is a strong need to support data recovery and bias correction efforts, but resources are inadequate. Improving coordination and simplifying access to observational data sets would greatly facilitate future reanalysis efforts.**

Day 2: Integrated Earth System Analysis

Goal

To provide an internally consistent, comprehensive, high quality record of the state of the Earth system and how it is evolving over time.

Achieving this goal requires developing the scientific capacity to assimilate observations from disparate observing systems into earth system models that include physical, chemical, and biological processes.

IESA fundamentally links advances in Earth System Models (ESMs) with advances in Earth System Observations.

Day 2: Towards an Integrated Earth System Analysis

R. Dole/D. Legler

Shaoqing Zhang

Jesse Meng

Ian Fenty (JPL)

Arlindo da Silva

Eugenia Kalnay

Dick Dee

Ichiro Fukumori

Overview

Coupled Model Assim. (GFDL)

Land Analysis for CFS-R

Ocean-sea ice assimilation

Coupled constituent assimilation

N. American Carbon assimilation

Data set requirements/readiness

Requirements – fcst. vs. attribution

Day 2: Key Points

- **Recent years have seen exciting new developments in analyses of other components of the earth system (atmosphere, ocean, land surface, cryosphere, and biosphere). Coupled data assimilation efforts are aiming to develop internally consistent representations of the interactions among system components and assess their implications.**
- IESA is a long term goal. Progress will proceed in steps. There are many challenges that need to be addressed along the way.
- Near term advances toward and IESA are feasible in several areas, as evidenced by presentations at this workshop and work elsewhere.
- Important areas for emphasis are to add new variables that are of high relevance to policy and decision support (e.g., atmospheric constituents, carbon cycle), as well as interactions among components that may lead to accelerated (or diminished) rates of climate change.
- Developing and organizing the required input data for IESA will be crucial. A suggested focus is on Essential Climate Variables as identified by GCOS.

Day 3: Application of recent reanalysis products

Rob Allen	Overview of ACRE
Ben Schenkel	Tropical Cyclones
Chidong Zhang	Diagnosing MJO/equatorial waves
Siegfried Schubert	Droughts and Floods/Boreal Summer
Carol Anne Clayson	Ocean Surface Fluxes
Edward Hanna	Greenland Mass Balance Changes
Tony Lee	AMOC
Prashant Sardeshmukh	Estimating Extremes
Tara Troy	Terrestrial water and energy cycles
Stephanie Dutkiewicz	Ocean ecosystem, biogeochemistry
Paul Stackhouse	Renewable Energy

Day 3: Key Points

- **As highlighted by the presentations, there are numerous existing and emerging new applications of reanalyses. There is vast potential value in reanalyses, but realizing that value will require high quality products and careful attention to user needs. While significant improvements were noted for some uses, there continue to be areas where current products have major deficiencies.**
- **Uncertainty is a key issue**, but how it is addressed and best communicated was not resolved. There are major needs for improved **documentation**.
- **Multiple streams of efforts will be required to address the wide range of user needs.** These will range from reanalyses over the longest feasible periods to those over shorter periods that use more complete data sets. Data sets needed for a more complete IESA have become available only in roughly the last decade, although the full period remains to be determined.
- In order to achieve the highest quality, it will be crucial to develop and support more coordinated, effective and sustained efforts in reanalyses at international as well as national levels.
- Reanalyses should serve as a **core component** within climate services.

Where we are going

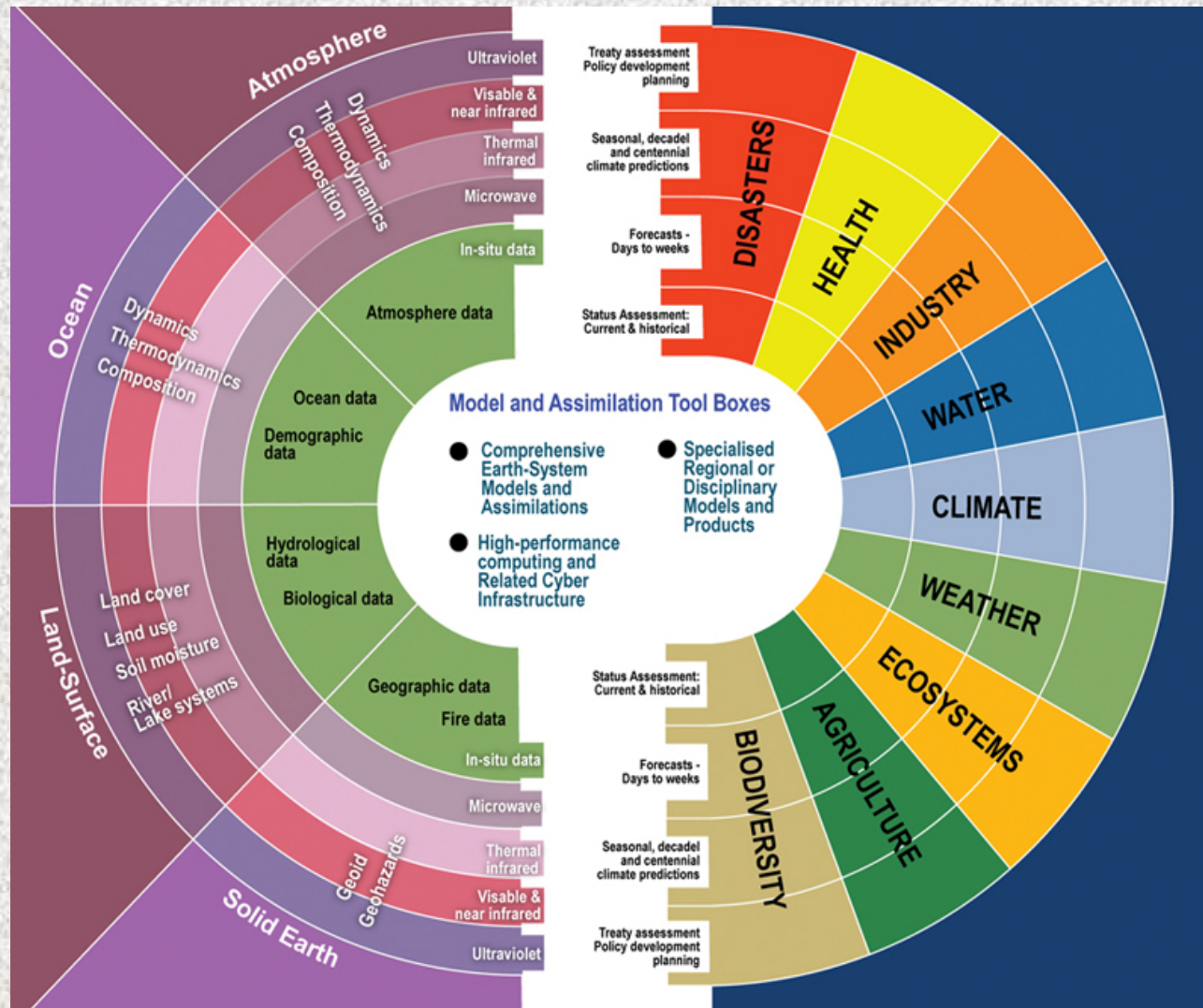
Within a few decades:

“A user will be able to get, on demand, climate or any other information for any place on the planet, on the land, in the oceans, or in the atmosphere, at any time, past, present, or future.”

Rick Anthes, President, University Corporation for Atmospheric Research

We are moving rapidly toward the formation of **climate services**, both within the U.S. and internationally (WCC-3 “A Global Framework for Climate Services”.) There are ever-increasing needs from policy-makers, decision-makers, and the public for reliable, science-based information to adapt to a variable and changing climate (Earth system) and to mitigate future changes.

Transformation of Observations into Climate (Earth System) Information



Next steps

- Prepare a workshop summary for EOS
- Prepare a paper on IESA for BAMS
- Report to USGCRP on this workshop and recommendations regarding needs to support reanalyses, with a long-term goal of an IESA to support national and international research and services.
- International meetings scheduled for fall 2011 and spring 2012.

Finally, thanks to the organizing Committee

Mike Alexander, NOAA ESRL

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