



NCAR Earth System Laboratory
National Center for Atmospheric Research

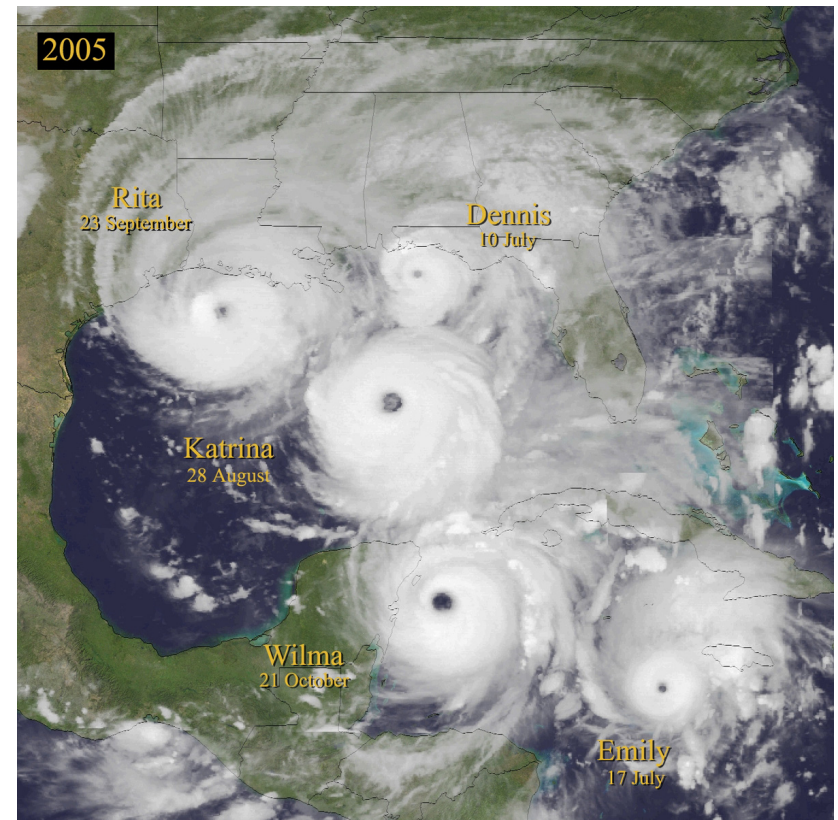
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Willis Research Network, Research Partnership to Secure Energy for America,
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Regional Climate Research using WRF and MPAS: Overview and Future Development.

Cindy Bruyère

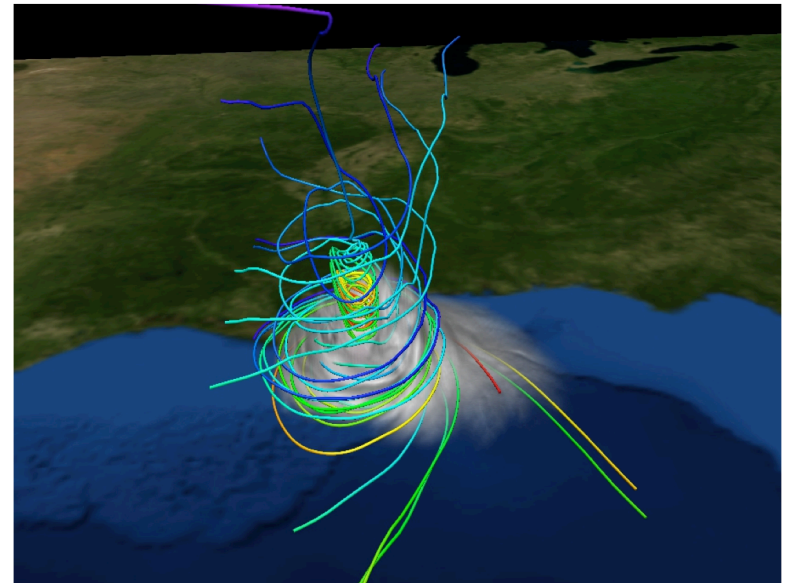
Greg Holland, James Done, Brian Bonnlander, Sherrie Fredrick, Tom Galarneau, Ming Ge, Abby Jaye, Mari Jones, Heather Lazrus, Rebecca Morss, Debasish PaiMazumder, Erin Towler

Bill Skamarock, Michael Duda, Laura Fowler

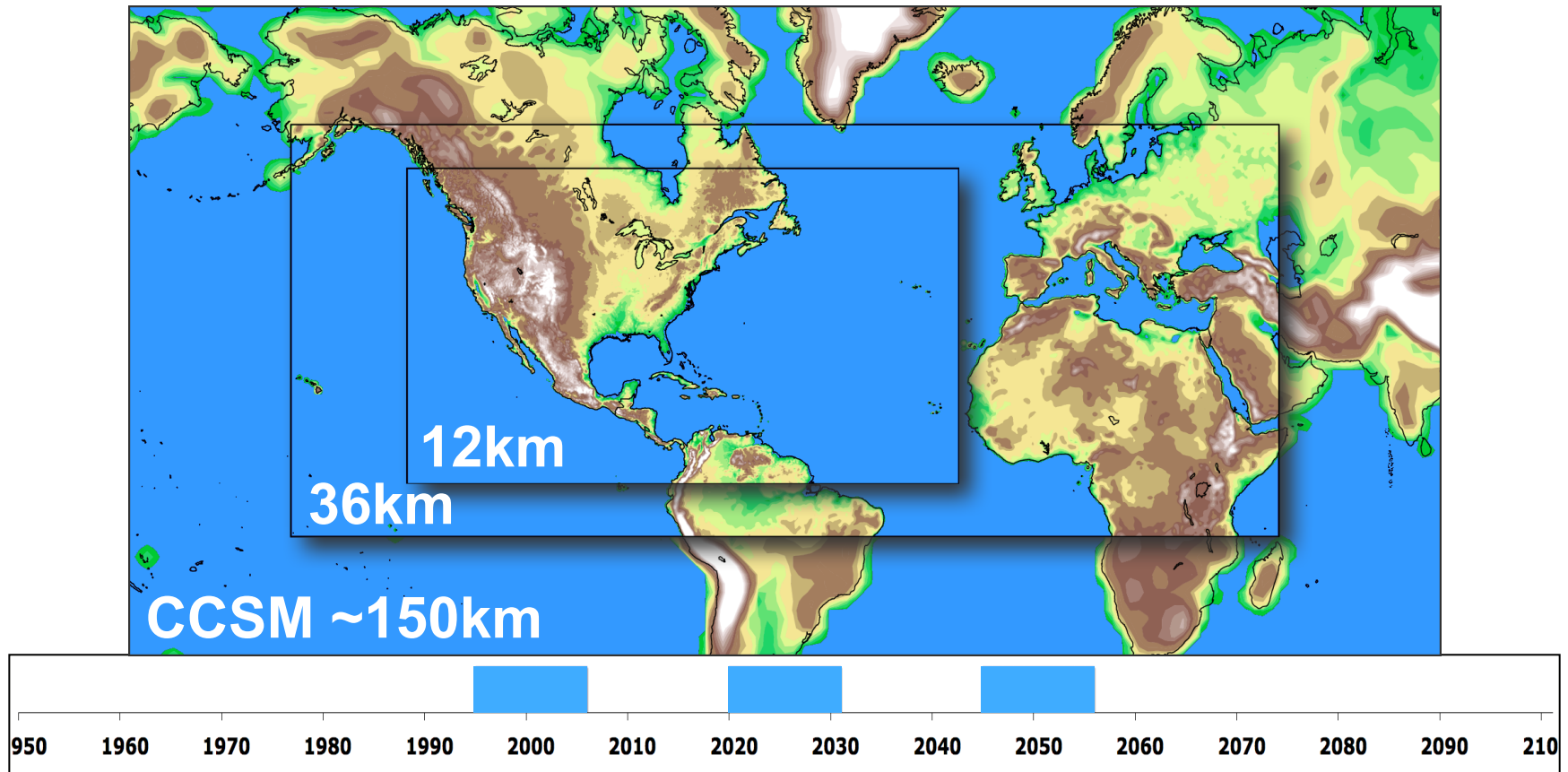


Introduction

- Past Dynamical Downscaling
 - What we have done and what is available for the community
- Future
- Tutorials and Community support



Nested Regional Climate Model



- Downscaling CCSM – A2 scenario (AR4)
- Time slices **1995-2005**, **2020-2030** and **2045-2055**
- 36 & 12 km model runs (*some select 4 km runs*)
- Single realization (*Noah; KF; WSM6; YSU; CAM*)

Publications

- Done, J.M., G.J. Holland, C.L. Bruyère, L.R. Leung, and A. Suzuki-Parker, 2012: **Modeling high-impact weather and climate: Lessons from a tropical cyclone perspective. NCAR Technical Note NCAR/TN-490+STR, DOI: 10.5065/D61834FM.**
- Bruyère C.L., J.M. Done, G.J. Holland, and S. Fredrick, 2013: Bias Corrections of Global Models for Regional Climate Simulations of High-Impact Weather, *In Review*.
- Done, J.M., G.J. Holland, and P. Webster, 2011: The role of wave energy accumulation in tropical cyclogenesis over the tropical North Atlantic, *Clim. Dyn.*, 36, 753-767.
- Done, J., G.J., Holland, C.L. Bruyère, and A. Suzuki-Parker, 2011: Effects of Climate Variability and Change on Gulf of Mexico Tropical Cyclone Activity. Paper OTC 22190 presented at the Offshore Technology Conference, Houston, Texas, 2-5 May.
- Done J.M., G.J. Holland, C.L. Bruyère, L.R. Leung, and A. Suzuki-Parker, 2013: Modeling High-Impact Weather and Climate: Lessons from a Tropical Cyclone Perspective, *Accepted in Climatic Change*.
- Holland, G.J., J.M. Done, C.L. Bruyère, C. Cooper and A. Suzuki, 2010: Model Investigations of the Effects of Climate Variability and Change on Future Gulf of Mexico Tropical Cyclone Activity. Paper OTC 20690 presented at the Offshore Technology Conference, Houston, Texas, 3-6 May.
- Holland G.J., and C.L. Bruyère, 2013: Recent intense hurricane response to global climate change, *Climate Dynamics*, 10.1007/s00382-013-1713-0.

Publications

- Hsu, H-M., J.J. Tribbia, M.W. Moncrieff, and C.L. Bruyère, 2013: Multiscale Spectral Structure of Maritime Continent Rainfall Simulated by a Nested Regional Climate Model and Observed by Satellites. *Climate Dynamics*, *Accepted*.
- Ray P, C Zhang, M Moncrieff, J Dudhia, JM Caron, LYR Leung, and C Bruyère. 2011: Role of the Atmospheric Mean State on the Initiation of the Madden-Julian Oscillation in a Tropical Channel Model. *Climate Dynamics* 36(1-2):161-184. doi:10.1007/s00382-010-0859-2.
- Rasmussen, R., K. Ikeda, C. Liu, D. Gochis, M. Clark, A. Dai, E. Gutmann, J. Dudhia, F. Chen, M. Barlage, C.L. Bruyère, and D. Yates, 2013: The Impact of Climate Change on the Water Balance of the Colorado Headwaters: High Resolution Regional Climate Model Simulations. *Submitted to J. of Hydrometeorology*.
- Suzuki-Parker, A., 2012: An assessment of uncertainties and limitations in simulating tropical cyclones. Springer Thesis. XIII, 78 pp.
- Towler E., V. Saab, R. Sojda, K. Dickinson, C.L. Bruyère, and K. Newlon, 2012: A risk-based approach to evaluating wildlife demographics for adaptation: A case study of the Lewis's Woodpecker, *Environmental Management*, 50, 1152-1163.

Data Availability

<http://rda.ucar.edu/datasets/ds601.0/>

CISL Research Data Archive
Managed by NCAR's Data Support Section
Data for Atmospheric and Geosciences Research

RDA

Go to Dataset:

[Home](#) [Find Data](#) [Ancillary Services](#) [About/Contact](#) [For Staff](#)

NCAR Nested Regional Climate Model (NRCM)
ds601.0

For assistance, contact [Thomas Cram](#) (303-497-1217).

[Description](#) [Data Access](#) [Documentation](#)

Abstract: This dataset contains climate model output data from the NCAR's Nested Regional Climate Model (NRCM). The NRCM combines the strengths of NCAR's Weather Research and Forecasting (WRF) model and NCAR's Community Climate Model (CCSM) into an instrument that will allow for fundamental progress on the understanding and prediction of climate variability and change. In particular, embedding WRF within CCSM will allow scientists to resolve processes at the regional scale, as well as the influence of those processes on the large-scale climate, thereby improving the climate change simulations and their utility for local and regional planning.

The output fields in this dataset consist of two- and three-dimensional arrays at three- and six-hourly intervals. A 3-D parameters is provided on model pressure levels: relative humidity, temperature, wind components, geopotential and potential vorticity. Additional 2-D parameters are provided at the model surface or near-surface level, and potential vorticity arrays are also provided on the 320 K and 345 K isentropic surfaces.

Data are available as monthly time series files in NetCDF. The data currently provided are from the climate runs over the model domain over the North Atlantic Ocean and USA. The simulation covers the periods 1995-2005, 2020-2030, and 2055.

Temporal Range: 1995-01-01 00:00 +0000 to 2005-12-31 21:00 +0000 (Entire dataset)
[Period details by subset](#)

Variables:

Air Temperature	Geopotential Height	Humidity	Longwave Radiation
Outgoing Longwave Radiation	Precipitable Water	Precipitation Amount	Runoff
Sea Level Pressure	Shortwave Radiation	Skin Temperature	Snow
Snow Depth	Snow Water Equivalent	Soil Moisture/Water Content	Surface Pressure
Surface Winds	Upper Level Winds		

Vertical Levels: See the [detailed metadata](#) for level information

Data Types: Grid

Spatial Coverage: Longitude Range: Westernmost=49.396E Easternmost=161.396W
Latitude Range: Southernmost=11.117S Northernmost=60.495N
[Detailed coverage information](#)

Data Contributors: [UCAR/NCAR/MMM](#)

Related Resources: [NCAR Nested Regional Climate Model](#)
[Library of sample plot figures from the NRCM RCPP 36-km simulation](#)

Publications: Done, J.M., G.J. Holland, C.L. Bruyere, L.R. Leung, and A. Suzuki-Parker, 2012: [Modeling high-impact weather and climate: Lessons from a tropical cyclone perspective](#). NCAR/TN-490+STR, NCAR, 28 pp. (DOI: 10.5065/D61834FM).

How to Cite This Dataset: Mesoscale and Microscale Meteorology, National Center for Atmospheric Research, University Corporation for Atmospheric Research, 2013. *NCAR Nested Regional Climate Model (NRCM)*. Research Data Archive at the National Center for Atmospheric Research, Computational and Information Systems Laboratory. <http://rda.ucar.edu/datasets/ds601.0>. Accessed dd mmm yyyy.

NRCM 36km RCPP WRF Simulation

Fields:

Average Fields:

<< < **September 2004** > >>

>

Sun	Mon	Tue	Wed	Thu	Fri	Sat
29	30	31	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	1	2
3	4	5	6	7	8	9

Displayed Hour:

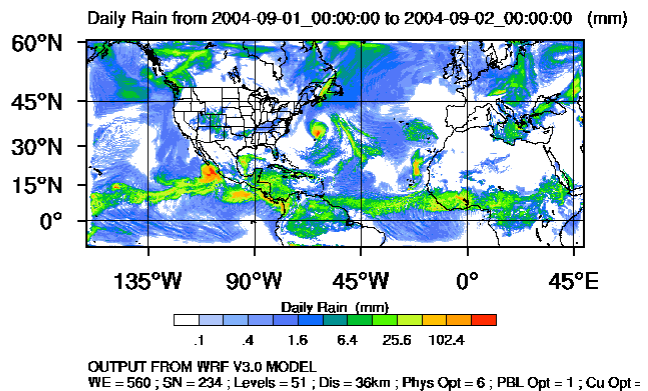
00:00 September 2, 2004

Web Page by Cindy Bruyere(MMM), Carl Drews (ACD), Sherrie Fredrick (MMM)

Regional Climate Prediction Program

36 Km WRF-ARW

Start Date : 1995-01-01 00:00:00



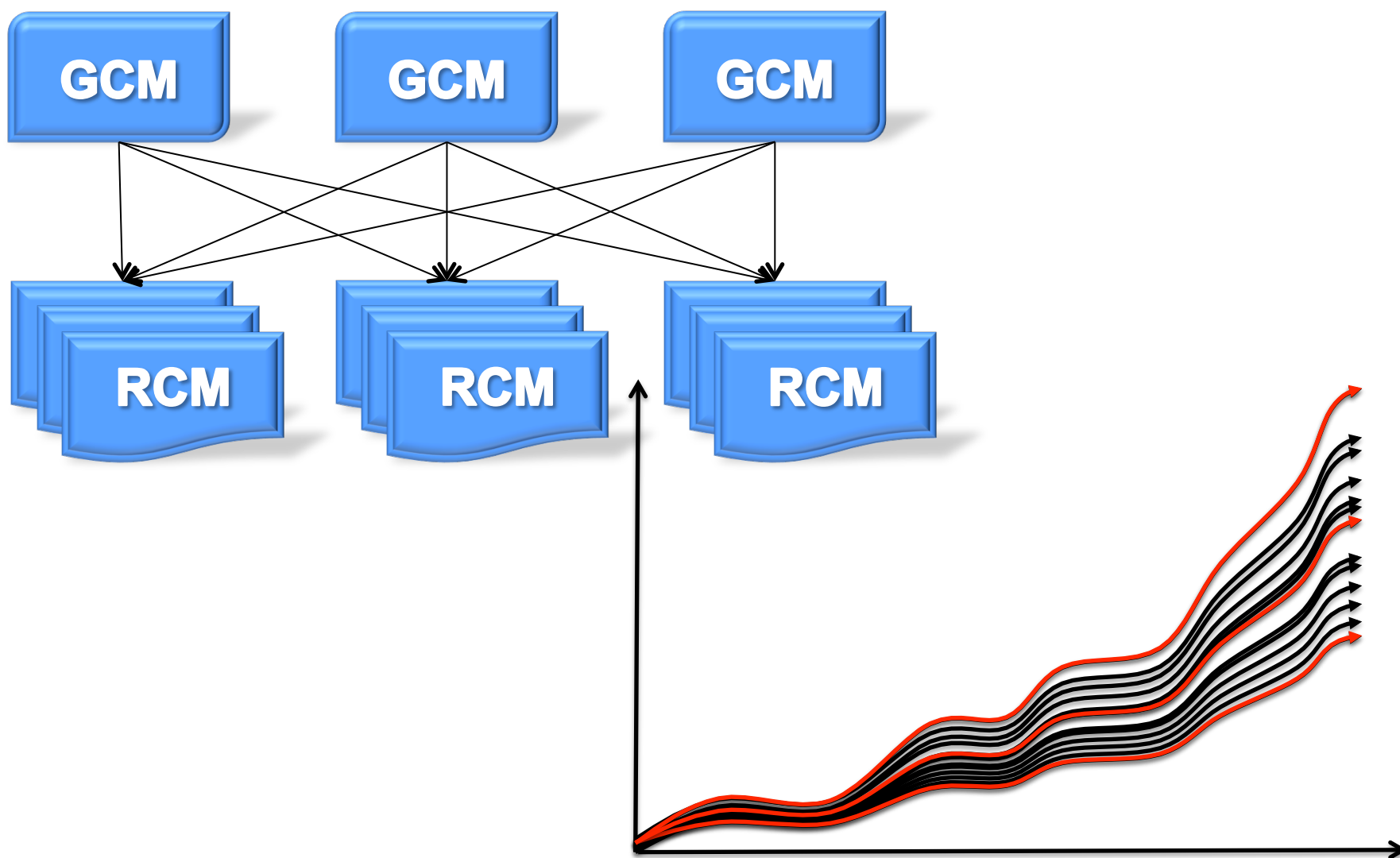
<http://www.mmm.ucar.edu/prod2/nrcm/RCPP/RCPP.html>

FUTURE

- Next NRCM model runs
 - Ensembles
- Coupling runs
- MPAS



The Need for Ensembles

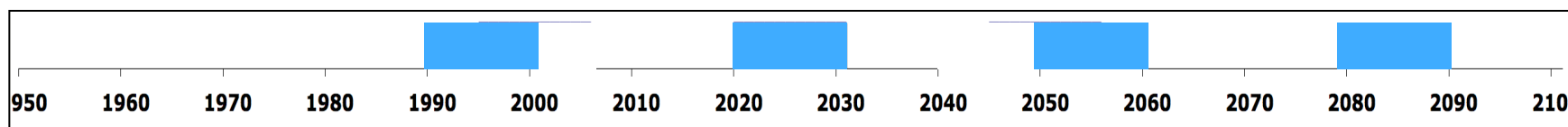


Ensemble Approach

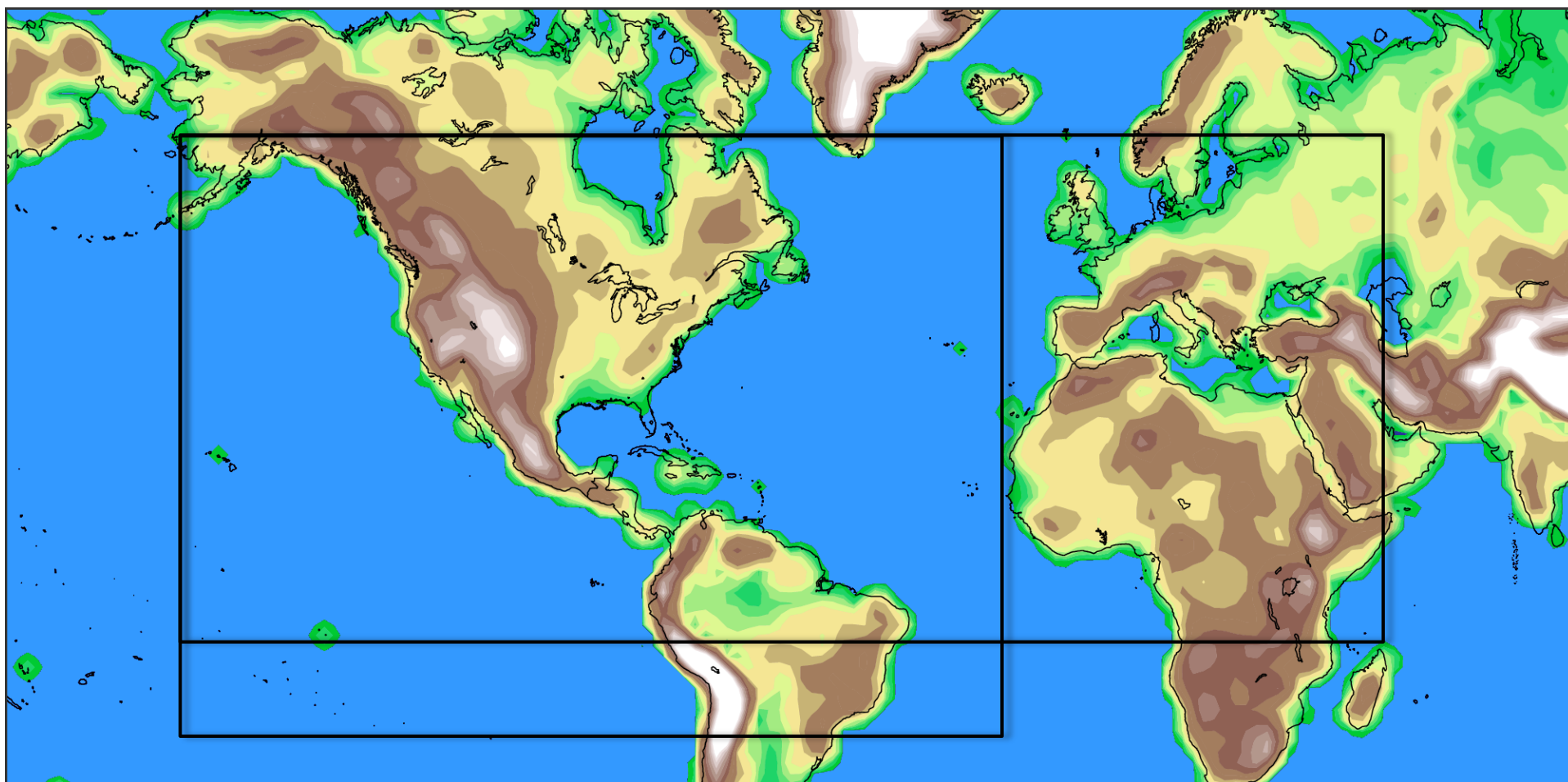


18 Ensembles (Reanalysis) ; 4 (CESM) – RCP 8.5

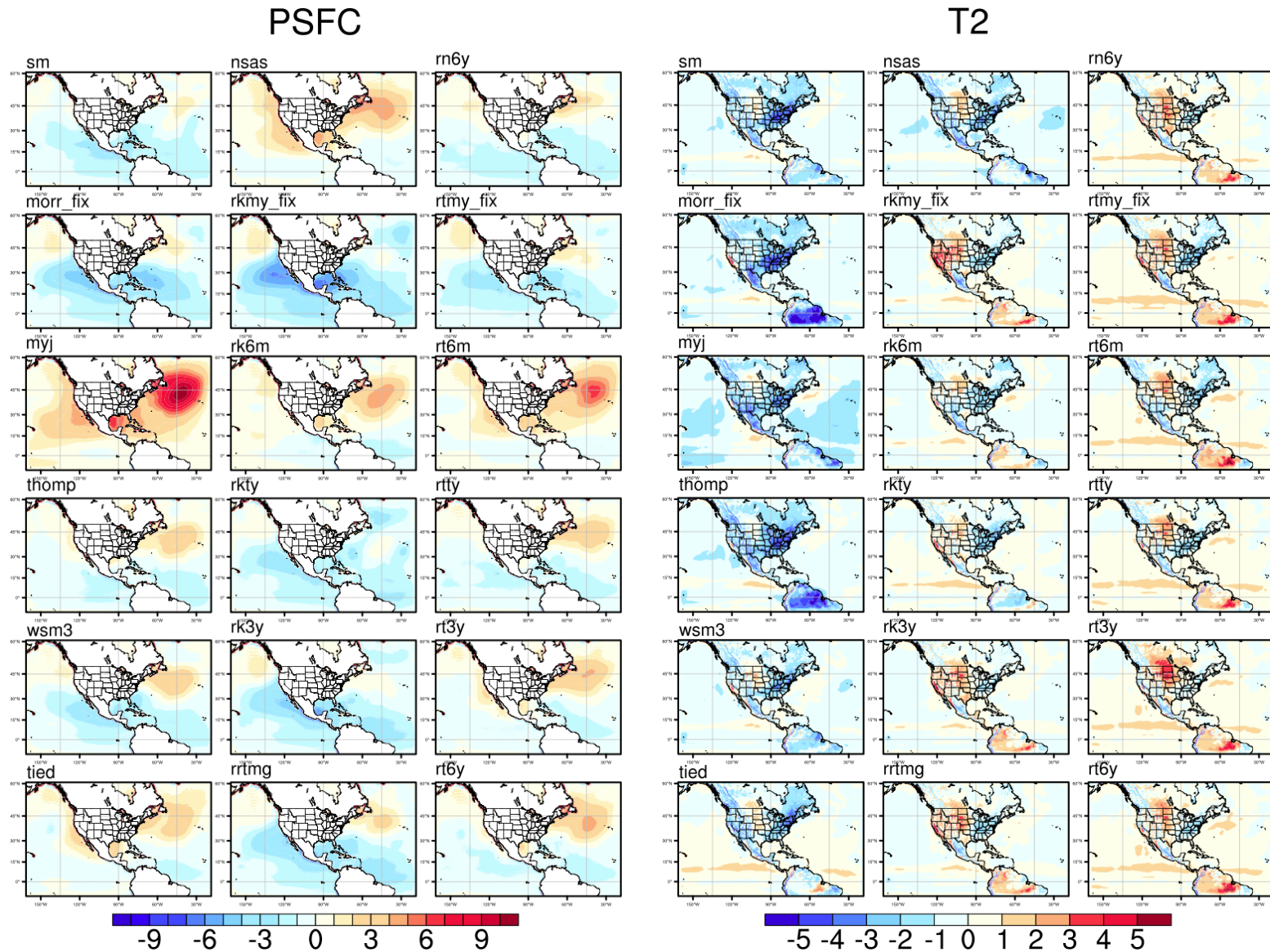
Cumulus ; Microphysics ; PBL ; Radiation



Regional Configuration



Preliminary Results



COAWST Modeling System

C

Coupled

MCT

O

Ocean

ROMS

A

Atmosphere

WRF

W

Wave

SWAN

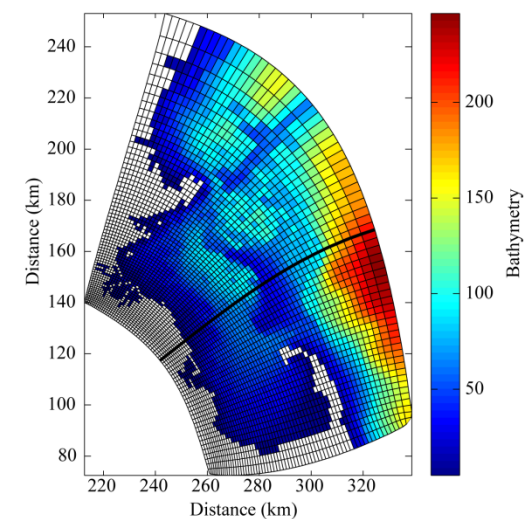
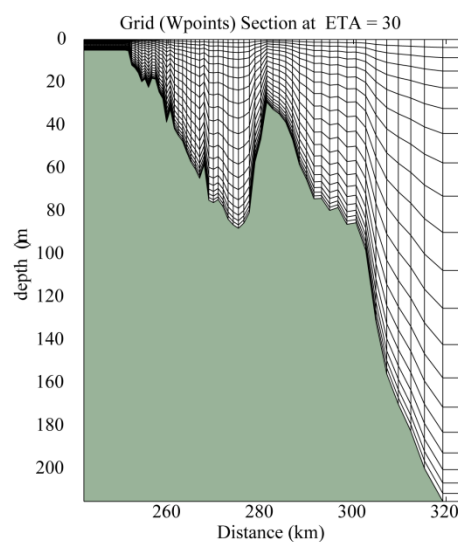
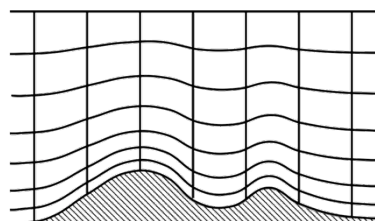
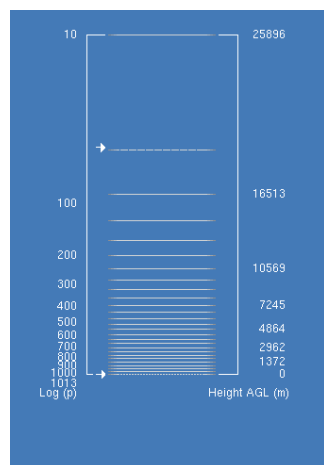
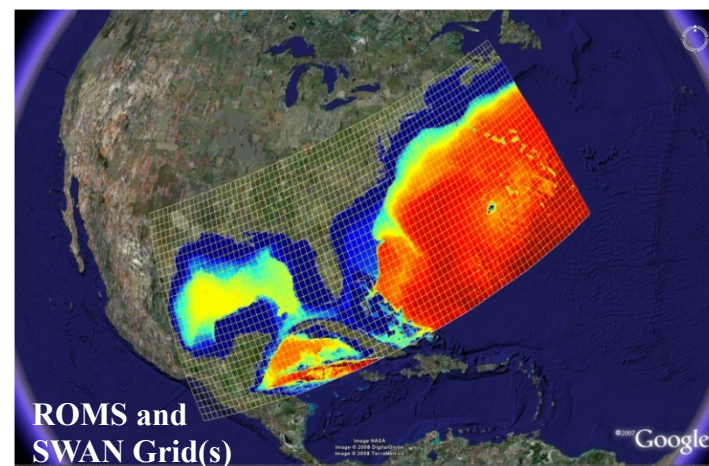
ST

Sediment Transport

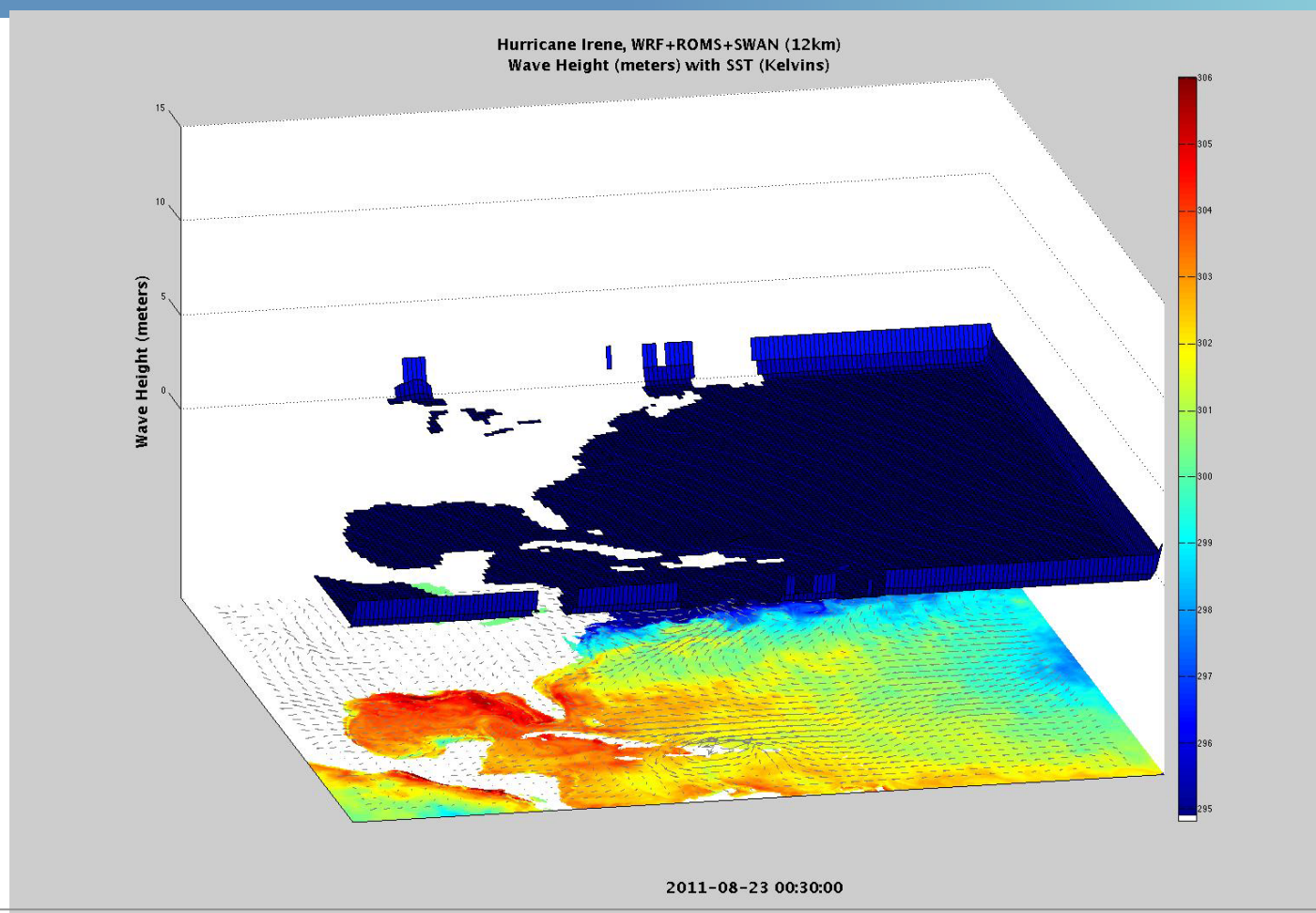
CSTMS



Model Setup



COAWST Model Runs

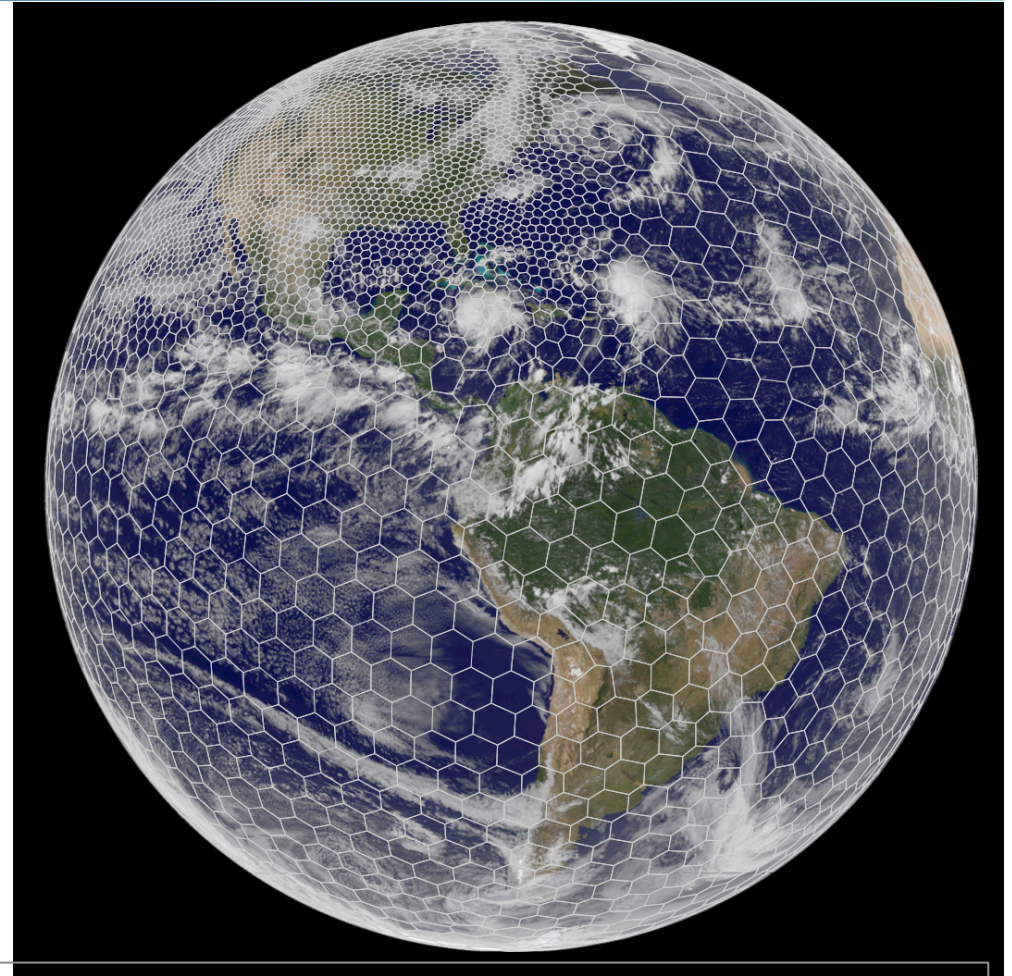
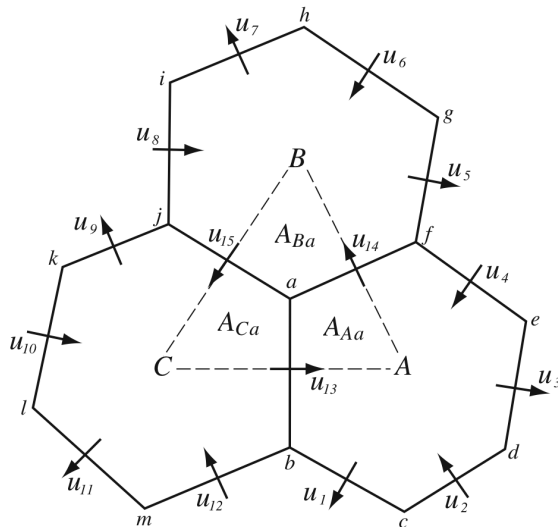


Poster 37: Modeling extreme events with a coupled WRF-ROMS modeling system. Mooney, Priscilla A., Frank Mulligan, Brian Bonnlander, and Cindy Bruyère

Model for Prediction Across Scales - MPAS

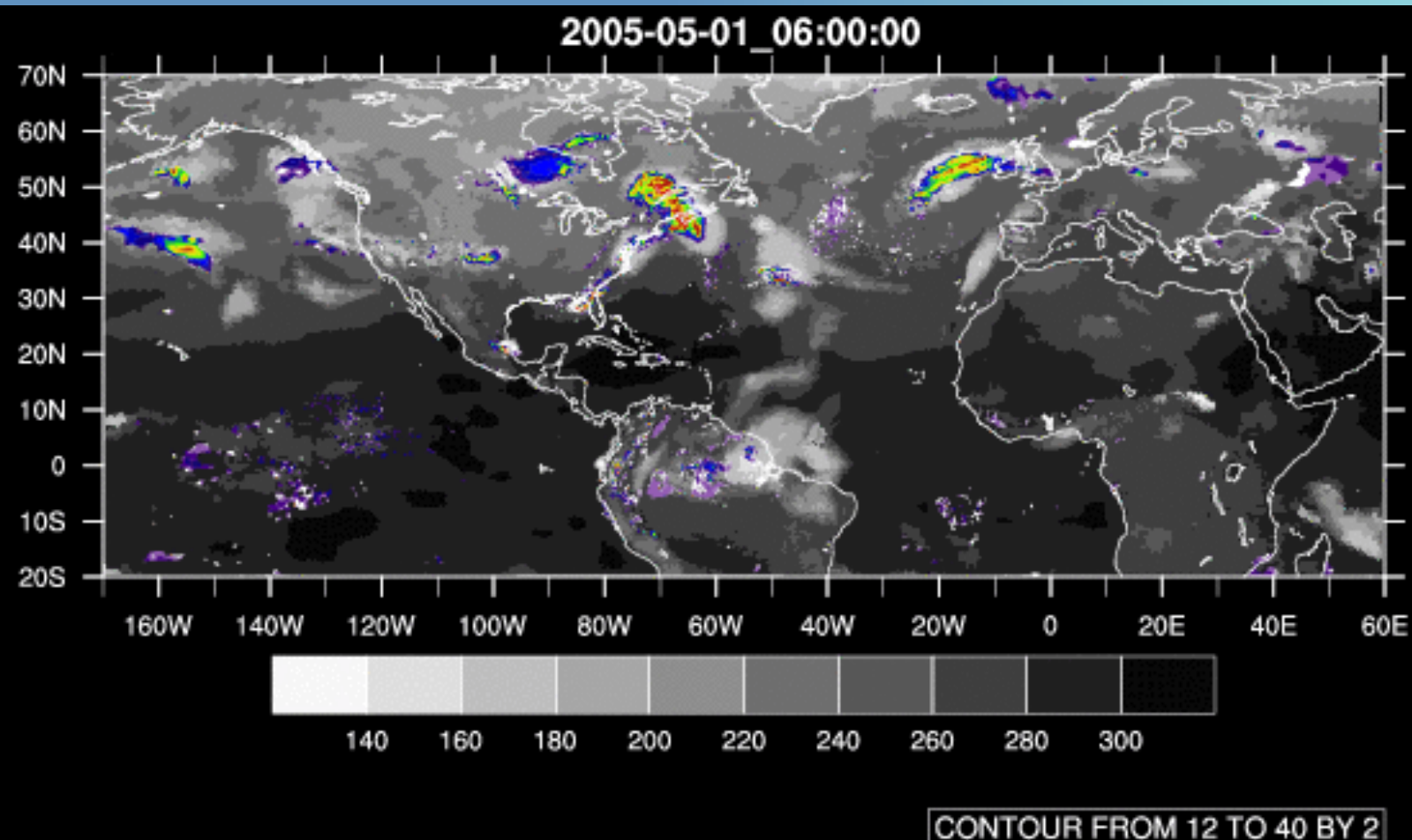
C-grid centroidal Voronoi mesh

Selective Grid Refinement



Session 10: MPAS: The model for prediction across scales. Skamarock, Bill, Michael Duda, Laura Fowler, Joe Klemp, and Sang-Hun Park

MPAS – Refined Climate Model Run



Poster 39: *Regional climate simulations using variable-resolution meshes. Fowler, Laura D., William C. Skamarock, and Cindy Bruyère*

Tutorials and Support

- Regional Climate Tutorial
 - July 26, 2013
 - Boulder
 - http://www.mmm.ucar.edu/events/tutorial_137/index.php
- Community Support
 - <http://www2.cisl.ucar.edu/easm-support>