

Update on VAMOS EXTREMES WG

Activities and Plans

- **A VAMOS task force on extremes was formed March 2008**
 - chaired by Jean-Philippe Boulanger and Lisa Goddard
 - report with recommendations issued on July 2008
- **VAMOS panel recommended creation of Extremes WG – September 2009**
 - Make progress on task force recommendations: Chairs S. Schubert and I. Cavalcanti
 - Focus on physical-dynamic forcing of extremes in the Americas
 - Take advantage of indices defined by the CLIVAR/CCI/JCOMM Expert Team on Climate Change Detection and Indices (ETCCDI)
 - collaborate with the CLARIS LPB Workpackage: “Processes and future evolution of extreme climate events in La Plata Basin”.
- **Main WG activities since officially starting in February 2010**
 - Finalized prospectus outlining plans and deliverables
 - Decided on membership
 - Held a teleconference discussing plans and first steps

VAMOS/EXTREMES WG

- Siegfried Schubert: NASA/GMAO –USA, (co-chair)
- Iracema F.A. Cavalcanti: *CPTEC/INPE-Brazil*, (co-chair)
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- Alexander (Sasha) Gershunov, Scripps, UCSD, USA
- Alice Grimm, Federal University of Paraná, Brazil
- Brant Liebmann: CIRES/University of Colorado, USA/SA
- Charles Jones: ICESS/UCSB-USA/Brazil/SA
- Dave Gochis, ESSL/NCAR, USA
- Hugo Berbery: UMD, USA
- Hugo Hidalgo: Universidad de Costa Rica, Costa Rica
- Jae Schemm: CPC/NOAA, USA
- Kingtse Mo; CPC/NOAA –USA
- Leila Vespoli De Carvalho: ICESS/UCSB-USA/SA
- Matilde Rusticucci, FCEN–Universidad de Buenos Aires, Argentina
- Olga Penalba, University of Buenos Aires, Argentina
- Paulo Sergio Lucio, University of Rio Grande do Norte, Brazil
- Tereza Cavazos, Dept. of Physical Oceanography, CICESE,
- Tim LaRow, COAPS/FSU, USA
- Viatcheslav (Slava) Kharin, Canadian Centre for Climate Modelling and Analysis, Canada
- Xuebin Zhang, Environment Canada

Overview of Prospectus

- **The overall focus is on improving our understanding of the mechanisms and predictability of warm season extremes over the Americas**
 - Specifically, the initial focus is on precipitation extremes
 - includes such phenomena as droughts/heat waves and floods
 - time scales range from daily weather events to subseasonal to decadal and longer-term variability
- **Consistent with Key Task Force Recommendations**
 - focus on droughts, pluvial periods, heat waves in the VAMOS regions
 - document extremes over the historical record
 - Consider key years/periods where extreme events were outstanding to further the understanding of mechanisms, predictability and potential early warning

Tasks

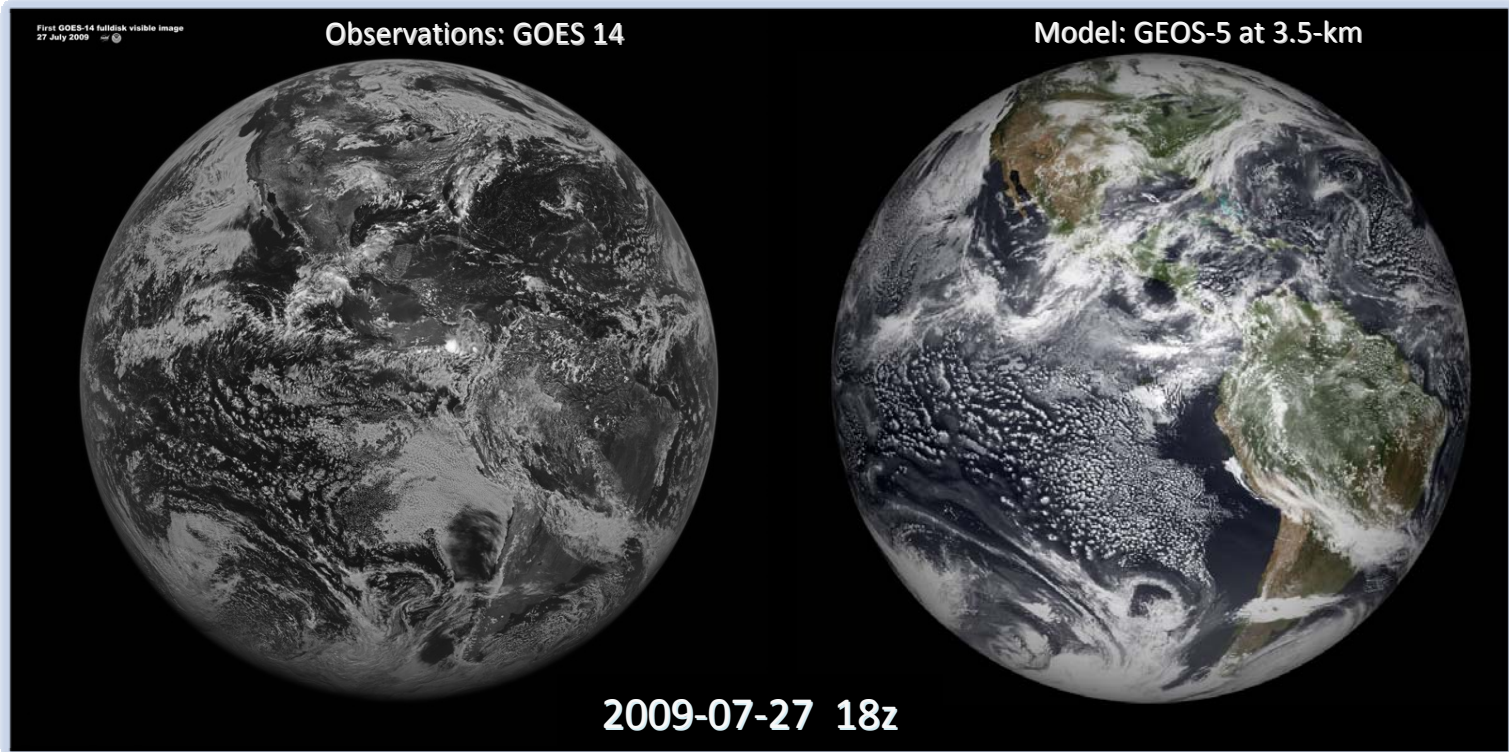
- **Develop atlas of warm-season extremes over the Americas**
 - focus on precipitation extremes (droughts and floods)
 - coordinate among various groups/WG members to get the best available observations suitable for the quantification and documentation of extremes
 - Interact with ETCCDI to take advantage of software and indices developed as part of that effort (<http://eca.knmi.nl/>)
- **Evaluation of existing and planned simulations**
 - CMIP5 IPCC/AR5 global and CLARIS-LPD regional scenarios, decadal hindcasts,
 - Seasonal hindcasts (e.g., CFSRR, GEOS-5), USCLIVAR drought simulations
 - Ultra-high resolution (10-20km) global climate model simulations
 - ICTP Workshop on High Resolution Modeling: <http://gmao.gsfc.nasa.gov/pubs/conf/>
 - Assess and analyze mechanisms using above atlas and latest high resolution reanalyses (e.g., MERRA, CFSR, ECinterim)
- **New model runs to address mechanisms and predictability of extremes**
 - Case studies of selected extremes (based on above)
 - Large ensemble, multiple models, multiple resolutions
 - Impacts of SST anomalies, MJO, stationary Rossby Waves, etc. on extremes
 - Link to IASCLIP modeling plans

High Resolution Modeling and Analysis of Mechanisms

- Examples of Modeling results
- Examples of relevant mechanisms

Goddard Earth Observing System (GEOS) AGCM

- GEOS-5 → GEOS-6 development
 - Non-hydrostatic global modeling
 - *Exploration of global cloud permitting resolutions (14- to 3.5- km)*
 - Pursuit of cloud resolving (< 1 -km) with explicit cloud micro-physics



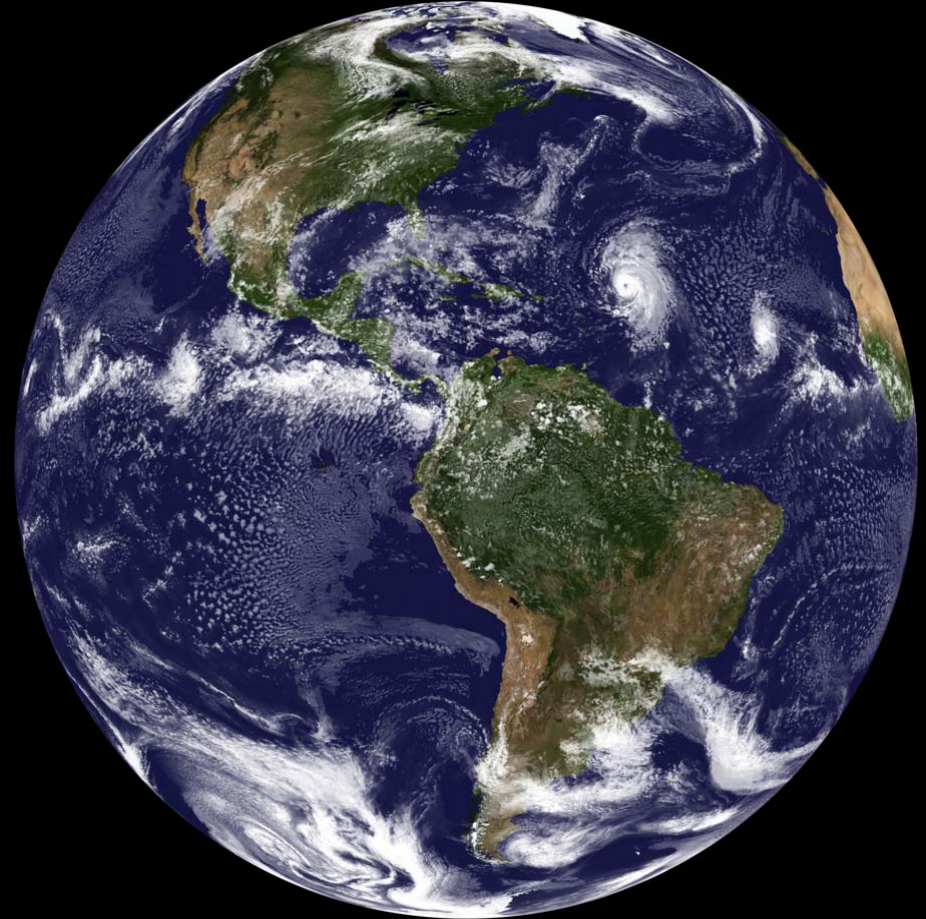
Tropical Convection & Hurricane Bill

72-hr forecast Initialized 2009-08-16 21z

GOES



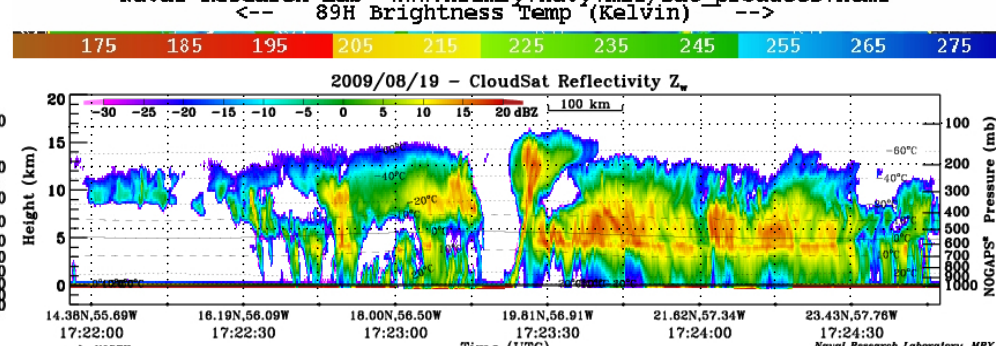
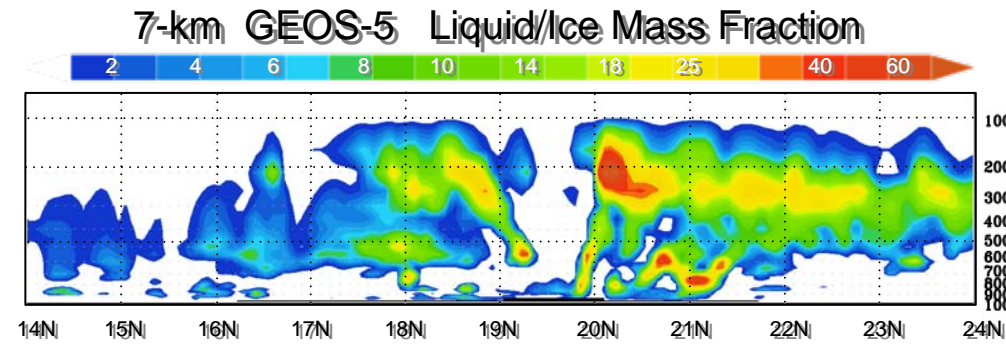
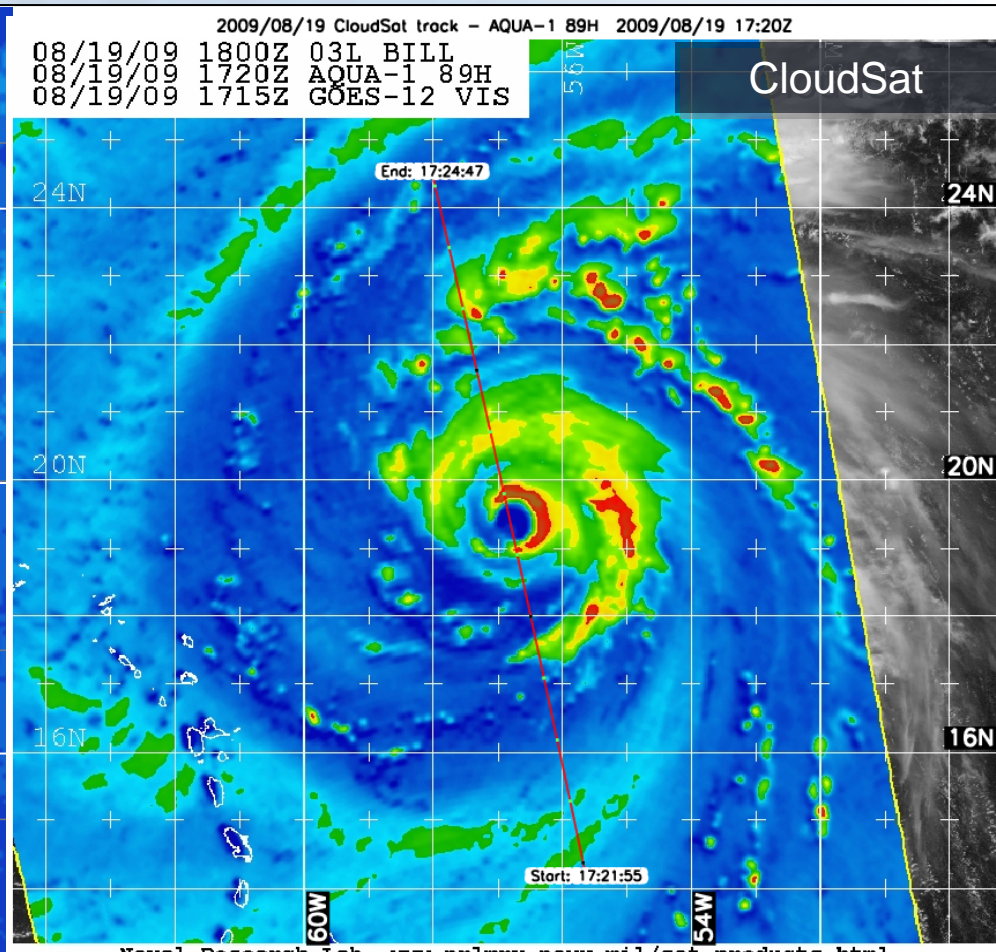
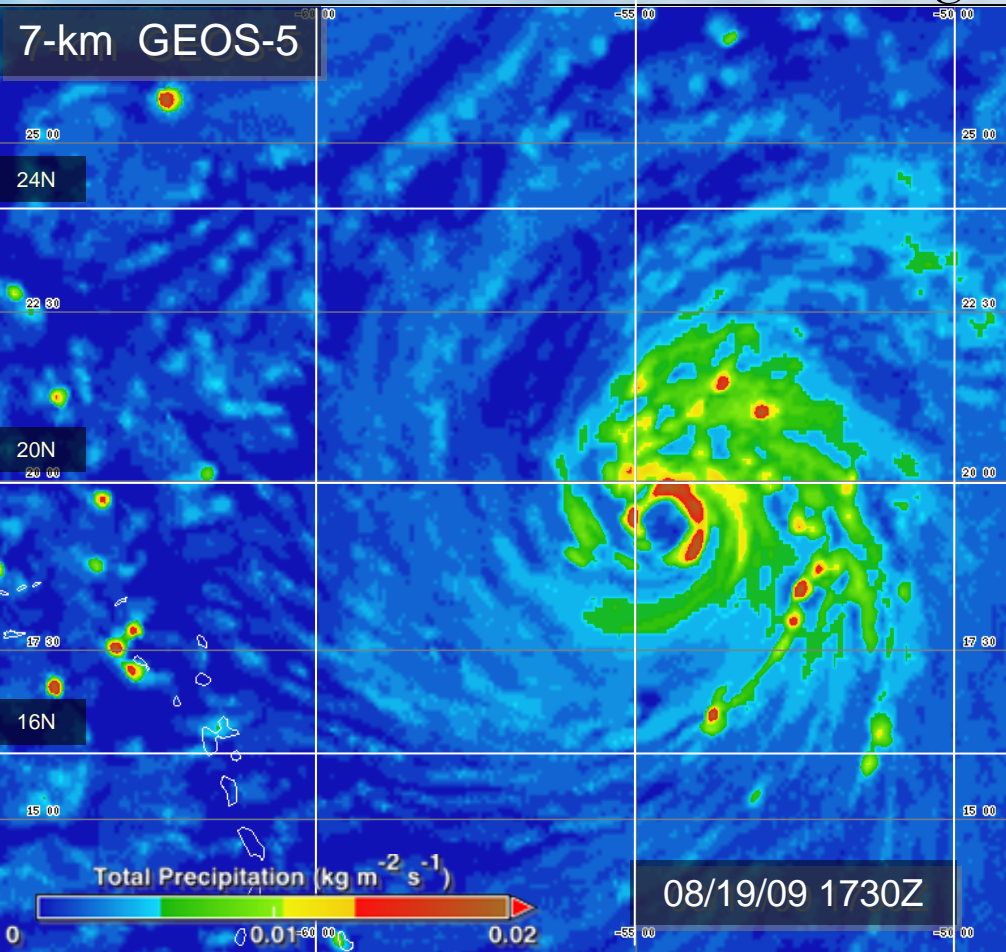
3.5-km GEOS-5



Hurricane Bill

69-hr forecast Initialized
2009-08-16 21z

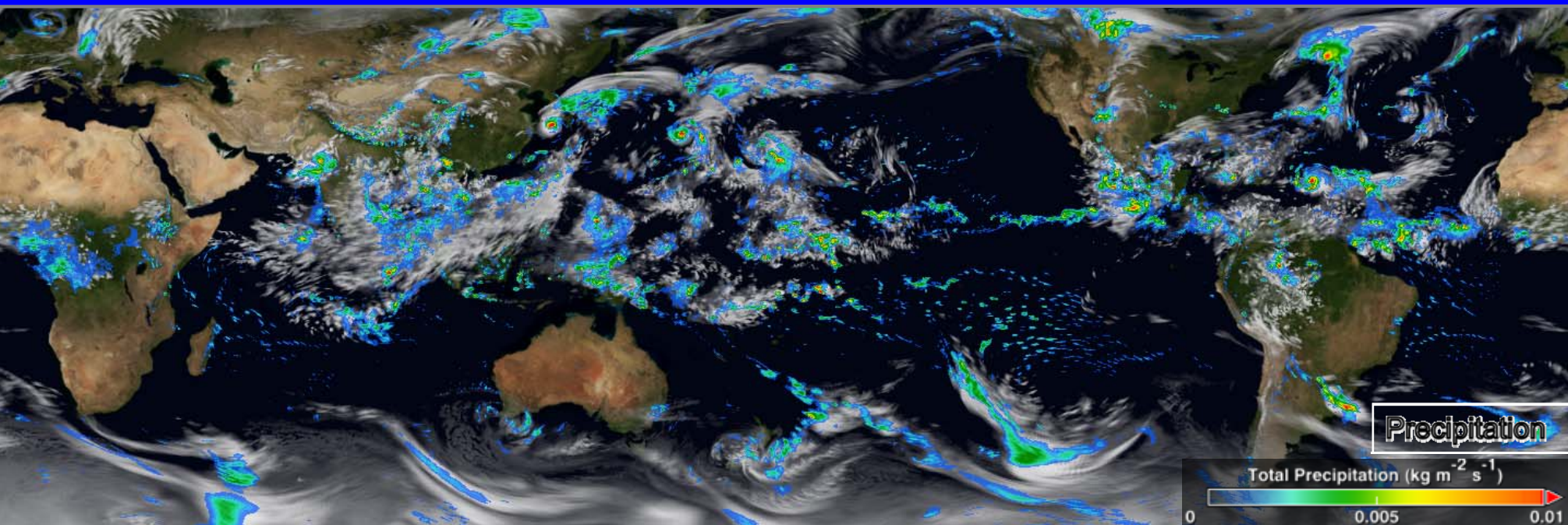
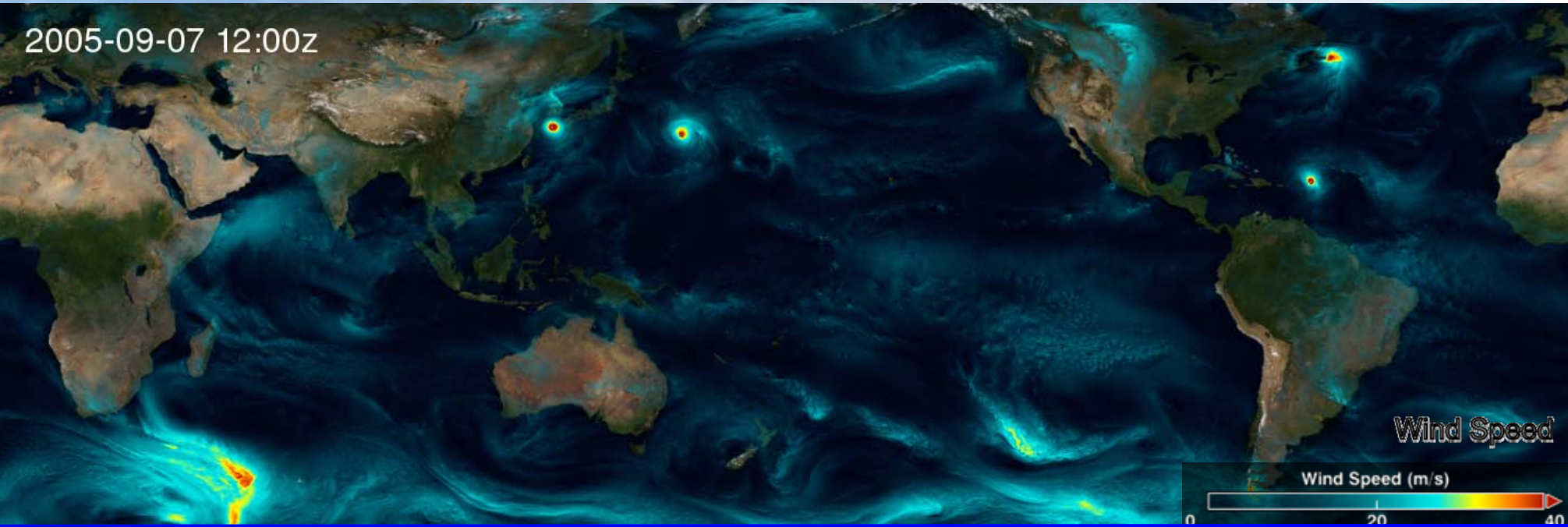
August 2009



2005 Climate and Tropical Cyclones

14-km

2005-09-07 12:00z



Global Tropical Cyclone Tracks 2005 (May-Dec)



Global Tropical Cyclone Tracks 2006 (May-Aug)



Summary

- The GMAO is developing ultra-high resolution (working toward cloud resolving) global models and data assimilation systems to facilitate:
 - addressing weather/climate issues (e.g., changes in hurricane activity and other extreme weather)
 - assimilating high resolution satellite observations
- Summary of high res runs that have been done by various groups can be found at: <http://gmao.gsfc.nasa.gov/pubs/conf/>

Schubert, S.D., I.-S. Kang, F. Kucharski, J. Shukla, 2009. **Summary Report of the Workshop on High-Resolution Climate Modeling.** *Abdus Salam International Centre for Theoretical Physics (ICTP), Trieste, Italy, 10-14 August 2009.*