

Management of a Community Model: The WRF Effort at NCAR

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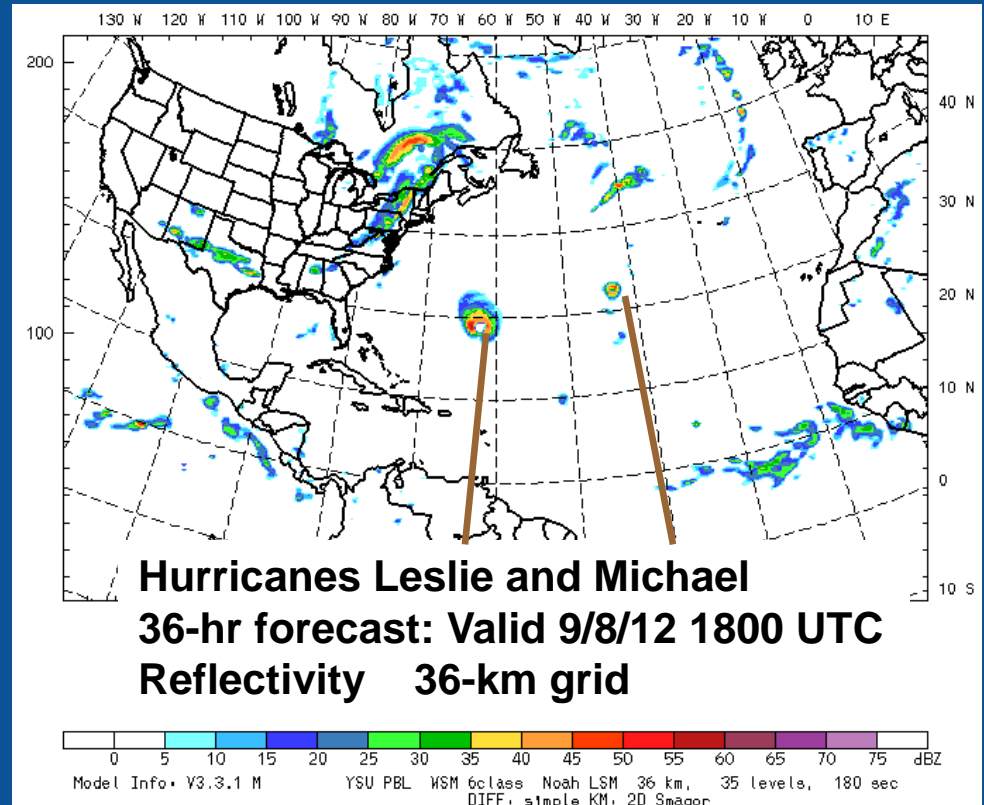
NCAR-Supported Community Atmospheric Model: WRF

- **WRF= Weather Research and Forecasting Model**
 - **A numerical atmospheric model designed for:**
 - ◇ **Research**
 - ◇ **Operational weather forecasting**
 - **Community model**
 - ◇ **Free software with development from a variety of contributors**
 - ◇ **Leveraged resource: Individual users benefit from the contributions of many others**

WRF Applications

- Meteorological research
- Numerical weather prediction (NWP)
- Regional climate research
- Atmospheric chemistry and air quality forecasting
- Teaching

WRF Hurricane Forecasting at NCAR

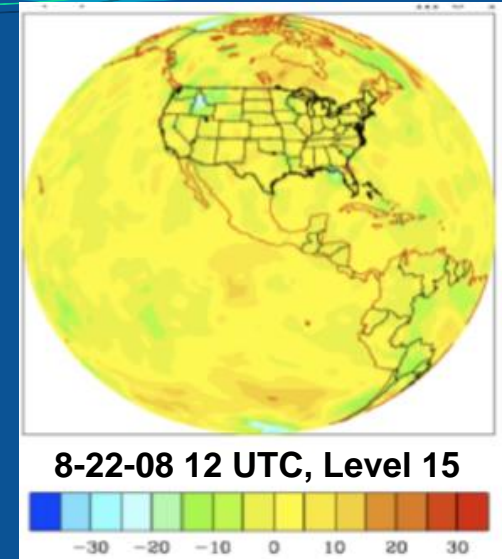


Model forecast grids: 36-km / 12km / 4 km

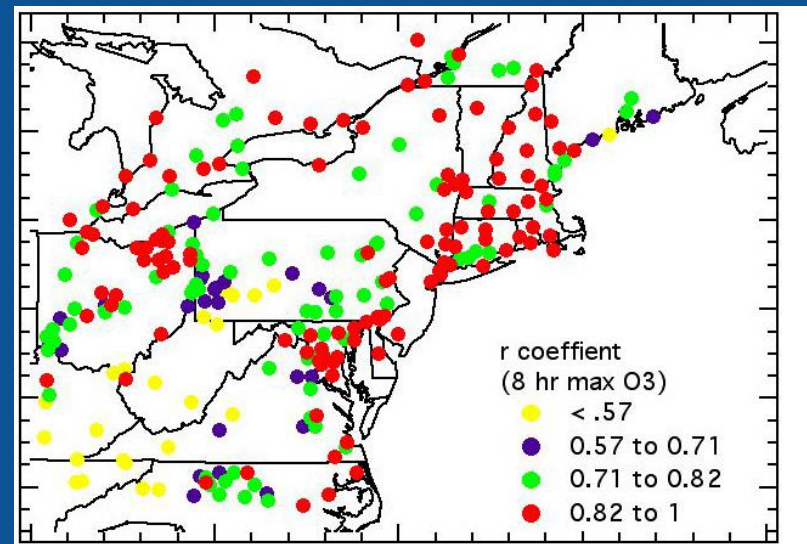
WRF System Elements & Coupled Models

- **WRFDA**— WRF Data Assimilation System
 - Purpose: Ingest of observations into simulation
- **WRF-Chem**— Coupled atmospheric chemistry
- **WRF-Hydro**— Coupled hydrology model
- **WRF-Fire**— Wildland fire model
- **Global WRF**— Structuring of WRF to run over globe

WRFDA: U (m/s)
Analysis–Background



WRF-Chem 36-h Ozone (27-km)



WRF Support by NCAR: Background

- December 2000: First release of WRF
- WRF provided freely and in public domain
- “WRF” — Trademarked by UCAR
- WRF available via web download
 - Requirement: No-cost registration
 - Registration: Name, e-mail, affiliation, location, WRF application
 - Purposes
 - (i) Statistics/info on usage / user base
 - (ii) WRF news subscription

WRF User Participation

Registered Users

U.S. Universities,
Gov't labs,
Private sector

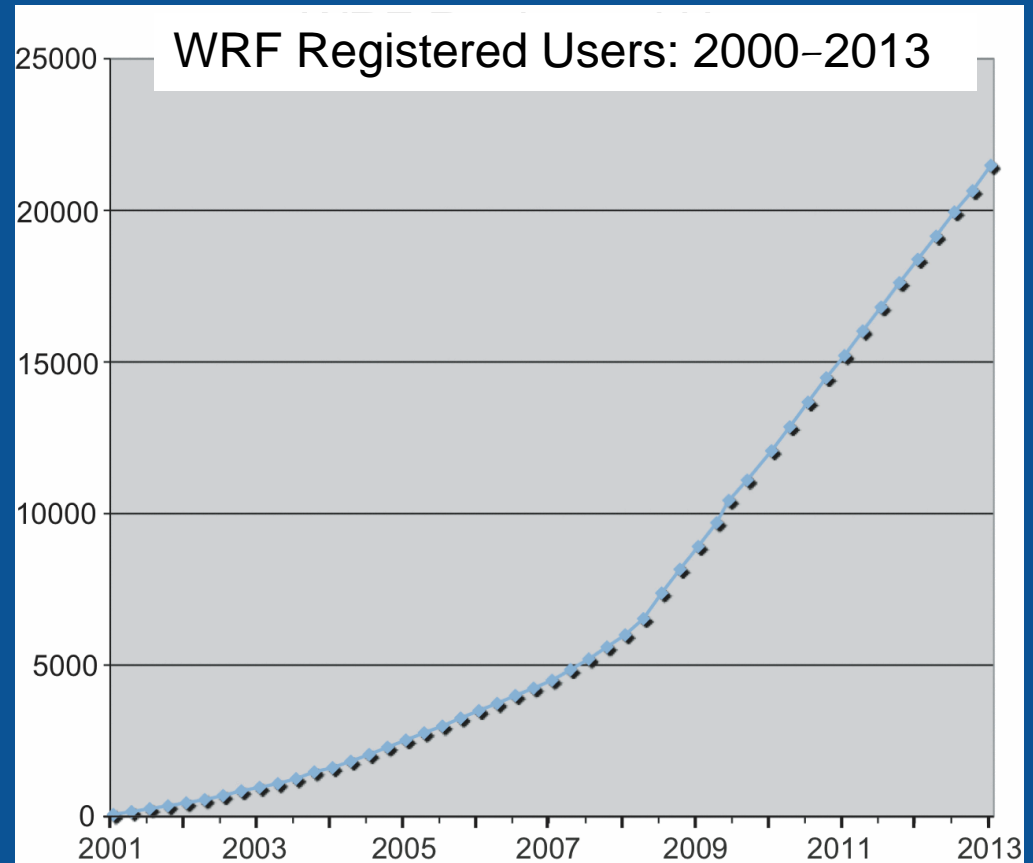
6782

Foreign users

14775

21557

**Countries
represented: 152**



7246: Active subscribers to wrf-news@ucar.edu

Worldwide WRF User Participation



 User Countries

 Operational/Realtime Forecasting Countries

152 Countries

WRF Community Model Support Activities

1) User Services

(i) Provide user assistance— **425** inquiries / month

(ii) Tutorials

– 2 / yr at NCAR (and other international venues)

(iii) Annual WRF Users' Workshop at NCAR

– 2012 workshop attendance: **240**

2) Maintenance of WRF Repository (WRF code)

3) Oversight / Issuance of Releases

WRF User Support Utilities

- WRF Users' Page

 - <http://www.mmm.ucar.edu/wrf/users>

 - WRF news and events

 - Model software and documentation

 - Online tutorial

 - <http://www.mmm.ucar.edu/wrf/OnLineTutorial/index.htm>*

 - WRF Users' Forum

- **User assistance service: wrfhelp@ucar.edu**

Supporting the WRF Community Model: Experiences / Lessons Learned

- **Success in Model Growth: Factors**

- 1) Model quality and capabilities: Reliable and suitable for a wide range of research
- 2) Open, non-proprietary code
- 3) Ease of use and code modification
- 4) Software portability and scalability
- 5) Large community → Encourages new users

- **Large User Community: Positive Feedback**

- 1) Attractiveness to prospective users →
Further growth of user base
- 2) More potential developers → Accelerates
improvement of system
- 3) More earth system models coupled to WRF →
Greater participation of users in other
disciplines and communities
- 4) Increases educational uses →
Grad student exposure → More future users

- **Large User Community: Positive Effects**

5) More use → More evaluation → Acceleration of developments and improvements

6) Greater publication history →
Greater acceptance by new users and scientific community

- **Challenges**

Overall issue: Adequate funding for personnel to provide system support

- 1) Servicing volume of help requests (425 / mo)
- 2) Code testing / support for a changing array of computing environments
- 3) Oversight of WRF repository, contributions, and releases
- 4) Demand for tutorials
- 5) Occasional: Export compliance (ITAR) restrictions

WRF Effort Plans at NCAR 2013

- Ongoing Support and Maintenance of System to Community
- Major Release, WRF Version 3.5: Spring 2013
- 14th WRF Users' Workshop: June 24–28 (NCAR, Boulder)
- Tutorials
 - Boulder, CO: July 2013
 - York, UK: Fall 2013

