SHINE Solar and Heliospheric Model Validation Project

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Workshop Comments
‘Validation Validation’

? Chenette – Scientific validation is a critical component of the CCMC mission.

? Mannucci – Scientific validation is not the same as operational validation. Both are critical.

? Sojka – Validation feedback does not get back to the developers in an effective way.

? Guhathakurta – TR&T not yet doing enough to Support model testing and validation.

? Schwadron – Validation, Validation, Validation, Validation, Validation, Val……
Goals

• Validation for Operations is labor intensive
  – Metrics are relatively few, relatively easy to define and relatively unchanging

• Validation for science use is potentially Very labor intensive
  – Range of Metric choices is much larger
  – Defining best metric for a particular process or physical feature is a research question and a significant part of the whole effort
  – Science community’s metric focus is a moving target
  – Community is small and manpower available for this is very limited!

• Can we automate the process?
  – Can we configure the process so it can tap the model developer’s natural development cycle?

• How can we make the process responsive to the needs of the research community?
Solution

• Develop a web based system to automate
  ➢ submission of model results by developers
  ➢ generation of validation-relevant graphics that enables competing models to be compared directly
    – Comparable models produce exact same diagnostics with exact same graphical design for ease of comparison
  ➢ review and ‘certification for release’ of graphics by model developers
  ➢ automated dissemination of ‘developer certified’ diagnostics
  ➢ submission of new graphics coding to enable validation process to expand its scope
SHINE Discussions and Planning

• Initial proposal presented at SHINE 2011
  – Acquired community buy-in
    • Not a model shootout !!!!!!
    • All about presenting validation data to community, not declaring winners and losers!
  – Discussed needs
  – Outlined basic web based approach to be implemented at CCMC
  – Chose initial test cases and diagnostics
    • ambient corona and inner heliosphere for CRs 2058 and 2062.

• SHINE 2012
  – Reported on initial data submissions
  – Established web site requirements and initial trial implementation

• July 2012 to Present
  – Built and tested core web site functionality
  – System officially turned on just before fall AGU 2013
Submission Process

Step 1: Register run, describe data format and identify suitable diagnostics

Step 2: CCMC acknowledges registration and returns submission instructions

Step 3: Submit your results file and a description text file to the CCMC anonymous ftp server
Step 4: CCMC system generates relevant validation graphics for this model and posts on private web page for model developer.

Step 5: Model developer reviews their model’s graphics and approves or denies for public viewing.
Public Dissemination

Step 6: Approved graphics are pushed to publicly viewable web pages.
Diagnostics Implemented

- Planar cuts
  - Synoptic Plots at variable solar distances
  - Equatorial cuts
  - Longitudinal cuts
- Generalized Timelines
  - Planet and spacecraft trajectories
  - Line cuts
  - Comparative
- Synthetic EUV Images
  (contrib. by Sarah Gibson)
- Synthetic Heliograph Images
  (contrib. by D.Odstrcil)
- Support for fieldline plotting with SWx2
Models Participating

- ENLIL (Odstrcil) – 3D MHD Inner Heliosphere, V2.7 and V2.8a
- HelTomo (Jackson et al) – 3D Heliospheric Tomography
- YMNP (Yeates, MacKay) – Coronal Non-Linear Force Free Model
- LFM-Helio (Merkin, Pahud) – 3D MHD Inner Heliosphere
- WSA (Arge) – Pseudo-potential corona + kinematic wind
- CORHEL (Riley at al) - MHD Corona and Inner Heliosphere
- AWM_2T (Oran, Sokolov et al) – 3D MHD, 2 temperature
- NLFFF (Asfaw, Weigelmann) – Coronal Non-Linear Force Free Model
- PFSS (MacNeice) – 3D Potential coronal field model
Current Status

- Baseline system has been on-line since Dec 6, 2013
- Have 9 models participating
- More than 600 diagnostics currently generated (most pending review)
SHINE 2014 and Future Development

- Review current system design
- Add test cases for solar maximum
- Discuss impact of time evolving magnetograms on model validation strategies
- Continue design of diagnostic processing for models with adaptively refined grids
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