Corona and Solar Wind

Topics, Goals and Schedule

1. Coronal Hole Boundary Identification
2. Coronal Structure
3. Ambient Solar Wind
4. Solar Wind Structure

- **Summary of Goals:**
  (1) To define metrics to assess the current state of space weather modeling capabilities from the perspective of:
    - end-users
    - science for space weather
  (2) Develop a process to capture science progress in first principles(?) models that feed into operations.

- Four 75 minute sessions
  - 3-4.15pm Monday
  - 4.45-6pm Monday
  - 4.45-6pm Wednesday
  - 3-4.15pm Thursday

Organization of Assessment - Steps

1. Are there any specific 'forecasting' related metrics for the topic?
   - What are the Forecasting Agencies Requesting? (extracted from 4 Monday am presentations).
   - 2-3 metrics spanning our 4 topics will be sufficient
2. For each topic, enunciate key science controversies which have some modeling relevance
   - Suggest metrics relevant to each science question
3. Identify models of relevance
4. Identify data sources of relevance to these models
   - Discuss issues with data sources

During Workshop

- Spent weeks before workshop calling the experts for info/guidance/recommendations
  - See workshop as the final part of this initial phase

1. *Develop a brief (1-2 pages max) 'review' of 'community' model development history*
2. *Identify physical processes recently introduced into these community models (1-2 pages max)*
3. *Identify the most significant ongoing weaknesses in these community models (1-2 pages max)*

Discuss during, draft after Workshop

Corona and Solar Wind - 5 Minute Summary

- 2 Sessions on Monday
- Focused on
  1. Operational Metric Suggestions
  2. Science progress on Coronal Hole Boundary Identification
  3. Solar wind topics – this afternoon and tomorrow afternoon

1. Possible Operational Metrics
   - Wind speed and CIR timing at L1
   - IMF Polarity and sector boundary crossings at L1
   - Nothing added from CH or Coronal Structure topics – will pose same question in this afternoons Solar Wind session.

Corona and Solar Wind - 5 Minute Summary

- CH Science Questions
  - List of pre-workshop science questions included
    - What is a coronal hole?
      - Definition depends on use to be made of CH location.
    - Detection approaches often selected based on final application goal
    - Detection algorithms can be tuned for long or short lived CHs, or for polar holes. Different tunings make a difference.
    - Magnetogram validation – a separate assessment topic (SHINE 2016, Pevtsov group)?
    - CH impact on irradiance
  - Workshop added
    - How alfven wave heating might differ between open and closed field corona
    - How do CHs develop?
    - How do CHs disperse and vanish?
    - Role of CMEs in opening flux or deflecting open flux
    - Importance of correct surface boundary conditions on model wind solutions

Corona and Solar Wind - 5 Minute Summary

- Relevant Models
  - Magnetogram based – open field regions
    - WSA, NLFF, CORHEL, SWMF
  - EUV observation based boundary detection codes
    - CHIMERA(Garton), CHARM (Krista, Gallagher), Reiss, R.o.B, SPOCA, NOAA SWPC(?), SolarMonitor(?), ASSA
- Data quality issues
  - Magnetogram validation – major issue!
- Suggested science validation activity
  - Comparison of CH boundaries from EUV image analysis approach with open field regions from magnetogram based coronal field models

Topic: Coronal Structure

- Schedule slide contributions (Pogorelov)
- Key Science Questions
  - Heating?
  - How much open flux?
    - Where is the open flux?
  - How much free energy in ARs?
  - Helicity evolution
  - Specific structures – eg filaments
  - Quiet vs dynamic
- List of likely models
  - WSA, CORHEL, SWMF, MagnetoFrictional Models (CGEM, MacKay et al), NLFF Models
  - Useful forward models for synthetic image construction (FORWARD - Gibson)
- Supporting Observations
  - Magnetograms, AIA
  - Use of time dependent LOS and Vector Magnetograms
  - Maturity of coronal field observations?
- Possible sample metric?
- Approach to evaluation of science progress?
  - Developing Coronal field ground truth
    - Comparison with automated(?) loop detection output?
      - Aschwanden, Malanushenko