SDO/HMI observing, the big picture

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Outline

- **Status**
- **Problems:** http://sun.stanford.edu/~schou/hmi/commis/issues.txt
- **Conclusion**

Status

- **Things are fine**

Problems

- **Image quality:**
  - Scattered light not reported or corrected for.
  - The correction of the disk center for the distortion leaves a 0.16 pixel y-offset of the images.
  - We do not yet have a very good estimate of the P-angle.
    - Lunar transit data is giving variations of 0.1 degrees or so.
    - Regulus observations may also help.
  - The image scale is not accurately known.
    - Lunar transit data and Regulus observations may also improve this.
  - Residual distortion.
    - We still see distortion in the images.
    - Also we can't combine the cameras.

Problems

- **Image quality - continued:**
  - The height of formation correction to the image center is based on FID
  - Does not take into account filter drifts.
  - Also it may cause a small offset in the radius.
  - There are a bunch of garbage cosmic ray records left.
    - The limits for the cosmic ray finder do not properly reflect tuning changes.
  - Residual flat field errors.
    - We still see an artifact in the observables power spectra.
    - Rotational flatfields have not been implemented.
    - Large scale flatfield variations are not well constrained between the times offset flatfields are made.
    - Flat fields are not good enough to be able to combine data from the two cameras.
  - Time after eclipses not marked
    - Images are of focus.

Problems

- **Non-vector observables calculation:**
  - Improve the Fe I line profile used to obtain the look-up tables
    - Use different profiles as a function of magnetic field strength and inclination
  - Improve the calibration of the non-tunable transmission profile
    - Revisit ground-based data
  - Take I-ripple into account in the transmission profiles of the filter elements
  - Implement a least-squares fit, instead of the MDI-like algorithm
  - For the MDI-like algorithm, use the second Fourier coefficients
    - It's probably related to the issues of finding a better iron-line profile and improving the calibration of the non-tunable elements)
  - Get rid of the front-window fringes in the look-up tables
  - For the MDI-like algorithm, implement look-up tables for the continuum intensity, linewidth and linedepth
  - Implement a time-dependent calculation of the filter-transmission profiles for vfisv

Problems

- **Non-vector observables calculation - continued:**
  - Make other observable products available
    - Tom and Junwei are using the "core-intensity", i.e. continuum-linedepth, and it would be more convenient if a series existed instead of them having to calculate their own products.
  - For the MDI-like algorithm, instead of using 1 look-up table for up to 6 months (interval between re-tuning), produce 1 look-up table per detune sequence taken, and implement a temporal interpolation between these look-up tables
    - The main difference should be that the Michelson drift is taken into account, but it's already taken into account by the polynomial correction.
  - Modify the QUALITY keyword returned by the observables codes so that it is more informative than it is now.
  - In the observables code, improve the decision-making process regarding whether or not to calculate observables: e.g., currently if for the temporal interpolation a given number of filtergrams are missing, the code does not produce observables, regardless of the location of these missing filtergrams...

Problems

- **Vector observables calculation:**
  - Part of the polarization dependent psf is still not corrected.
    - In particular the spatially dependent component.
  - Similarly only an axisymmetric correction is made to the telescope polarization.
    - The telescope polarization is a misnomer and not physically based.
  - Time dependence of the polarization calibration is ignored.
  - No on-orbit checking is performed.

Problems

- **General issues:**
  - HCM algorithm causes 135s period in mean velocity.
  - Mean intensity of images is drifting and not in the same way for the two cameras.
    - Cause unknown.
  - There is no tracking of which code versions are used, when they change and what the differences are.
  - There is very little documentation of what is actually implemented.
    - What is in various papers is not what is actually done.

Conclusion

- **Any questions?**