Summary of the 18 June, 2019, Videocon

Attendees were:

Jørgen, Kiran, Jesper, Rachel, Rafa, Sushant, Sergei, Sylvain, Sasha, Savita, Angela

Rafa summarized his first discussion with Michael Thompson on the rotation project. The original idea behind this work was

- to produce a best possible unique rotation profile with improved error bars using observations in all degree ranges for about two solar cycles from various observing sources, and
- to submit a paper to Science or any other journal of similar nature.

It was felt that the goal was yet to be achieved; however, there was a consensus that we should start summarizing results in the form of a research paper. The improvements in the rotation profile should be clearly highlighted in the paper.

In addition, with the improved resolution from HMI, the profile in near-polar regions should be better than the previous one. Another aspect of this project is to explore the changes in the rotation profile with time.

Since Jørgen had distributed the outlines of the first paper in ApJ format prior to the May meeting, there was a discussion on the data to be included and whether the entire work should be split into multiple papers. However, it was suggested that an initial step would be to collect the relevant basic material in a single paper, as a starting point for possible development of several papers.

Jørgen asked for contributions on data and the techniques from various co-workers that he intends to include in the paper, ideally before the next meeting. He would then attempt to start the edit of this into a somewhat uniform text.

Data format for comparison: It was suggested again to use a common format file for the inversion results (see also Summary of April meeting). Sylvain suggested to fill in empty columns with a negative weight. An ASCII file seemed to be most appropriate option for this purpose; however Rachel had some concerns. Also, the locations of the averaging kernels and the widths of latitude grids should be well defined. Sylvain further suggested to include a file describing each column either separately or in the header. A need for the exchange of averaging kernels between various inverters (Jesper, Rachel, Sarbani, Sylvain.......) was felt. One should clearly specify the *multiplication factor*, if any, used in the inversion. **[I am not sure what this might refer to; I hope somebody can clarify !jcd]**

Sylvain briefed on results providing an update on the real errors in artificial data. He did not find any drastic change in the solution; however the distribution of the uncertainities on the solution is different. Detailed results can be accessed at

https://www.dropbox.com/home/Rotation%20Inversions/SylvainKorzennik/190524?preview=report-test1.pdf

Rachel experimented with the different trade-off parameters in the inversion. Her results can be viewed at

https://www.dropbox.com/home/Rotation%20Inversions/RachelHowe/20190617

In the README file posted in the above folder, she wrote

RLS tradeoffs:

1) *I solved my problem with the RLS avker CG calculation. The plot bigremap_rots.png (Figure 1) shows a grid of remapped RLS inversions of the noise-free artificial data (with error bars from the noisy set as before.)*
2) *My first attempt at doing a 2dRLS tradeoff curve:(Figure 2) tradeoff.png plots the overall inversion chi-square against the RMS error for the whole inversion, with point color-coded by mu_r, which clearly dominates the variation in this cases. tradeoff2.png (Figure 3) separates out the curves for each mu_r. This looks as though the optimal solution would be around mu_r=1e-5,mu_t=1e-3, which is more smoothing than I would normally use even for a standard GONG or HMI dataset..*
3) *bigtrade.png (Figure 4) is my attempt at doing tradeoff curves for different locations, plotting the geometric mean of the averaging kernel radial and angular widths against the error at a given location. The colored lines join points of the same mu_r and the color of the symbols shows mu_theta. At some locations the kernels aren't well localized,as you can tell by the other figure, and the oddness of the tradeoff plots reflects that. In other places we get a nice family of curves, but it isn't clear that it's useful; apparently for a given mu_theta the best mu_r to get small errors and small kernel widths (at sensible locations) is always the biggest one.*

Rached and Sylvain will compare their results on the RLS inversion. Note that Sylvain has used only 1 tradeoff parameter so far. These results will also be compared with those obtained using OLA inversion.

Project Archive: Sushant worked with John Britank (NISP Data Center staff) to create a password protected webpage for archiving project-related old files, as a supplement to the dropbox.. It can be accessed at

https://gong.nso.edu/Solar_Rotation/

As discussed at the last meeting, **the access to this site to should strictly restricted to the members of the project team**. If you are interested in accessing this site, please contact me for the username and password. I shall start moving old files from Dropbox after the next meeting on August 9.

Next meeting will be on August 9, 2019 (Friday) @10:00 AM MDT.