# Coming Attractions

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# ITRF2020

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The next iteration of the ITRF is ITRF2020.

Just 2 ½ years from now.

A fair amount of software needs to be developed and tested before then.

Suggested goal to get this done is 30-June-2019.

Details follow.

# Software changes due to better models

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- All of these results from improved physical/geophysical models.
- Due date for implementation varies.
  - In the following I give some dates.
  - Please let me know if this is an issue.
- Amount of effort to implement varies.
- These are required changes.

Everyone must make these changes to ensure consistency between different VLBI solutions, and between VLBI and other techniques.

# Galactic Aberration (1)

IVS Working 8 has finished its final report and made a recommendation to use the average value from VLBI estimates of 5.6 uas/yr.

This is close to independent estimates from astronomy that has a value ~4.9uas/yr.

$$\Delta\vec{s} = \Delta t \cdot \{\overrightarrow{s_0} \times \vec{a} \times \overrightarrow{s_o}\}/c$$

Here $\overrightarrow{s_0}$ is the original unit source vector, $\vec{a}$ is the acceleration vector, and $\Delta t$ is difference in time.

# Galactic Aberration (2)

Effect of aberration is given by:

$$\Delta\vec{s} = \Delta t \cdot \{\overrightarrow{s_0} \times \vec{a} \times \overrightarrow{s_o}\}/c$$

Here $\overrightarrow{s_0}$ is the original unit source vector, $\vec{a}$ is the acceleration vector, and $\Delta t$ is difference in time. For further details see WG8's final report.

For 24 hour sessions which the whole sky, effects on (non-source) parameters are expected to be small.

This may not be the case for intensive sessions.

Implementation deadline: 30-Sep-2018

# Gravitational Antenna Deformation (1)

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Earliest paper that I know is based on finite element analysis of Gilrceek antenna done by Per Thomsen in the 1988. He derived a general model for the change in delay as a function of elevation.

More recent work by P. Sarti, C. Abbondanza, L. Petrov, M. Negusini, A. Nothnagel, … and many more.

Primary effect (assuming uniform sampling of the sky) is to change estimate of local up. This can be large, on the order of a few cm.

# Gravitational Antenna Deformation (2)

Axel Nothnagel has volunteered to tabulate the results from the literature and to put things in a common format.

We (IVS) should make an effort to measure or model remaining VLBI antennas. Cost ~$30K/antenna, but a one time effort.

Software implementation deadline: 31-Dec-2018

# New HF-EOP model (1)

The current IERS HF-EOP is 20 years old.

This model has been modified twice to include:

- The effects of Polar Model Libration (2003)
- The effects of UT1 Libration (2010)

Even with these additions there is significant disagreement between the model and empirical results from VLBI and GPS.

# New HF-EOP model (2)

An outgrowth of the 2017 UAW in Paris was the establishment of an IERS working group to recommend a new HF-EOP.

This WG has been inactive for ~6 months, but I intend to start pushing.

This model will be part of the next IERS standards. Like the current model, this will be given in terms of tidal lines, so the implementation should be easy.

# Linear Mean Pole Model

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IERS is changing the model for linear mean pole.

Going back to very similar to what we used to do.

For consistency with other techniques, VLBI software needs to be modified to use the new/old model.

Deadline: 2019-Mar-31

We should only turn this in on coordination with other techniques.

# Pressure Loading (1)

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For the next ITRF the IVS will include pressure loading corrections.

- We need to ensure consistency between different ACs
- We also need to allow the ITRF combination centers to ‘back-out’ contribution of pressure loading.
  - This can be done by putting additional information in the Sinex files.

# Pressure Loading (2)

Effect of pressuring loading on Normal equations:

$$NA = B + \Delta B$$

Where $\Delta B$ is the effect of the loading correction. Normally this is just absorbed in B.

But we need to keep track of this separately, and include it in the Sinex files.

Exact format for this has not been specified.

I will follow up and send information when I have it.

Deadline for implementation: 30-Jun-2019

# Additional Info in Sinex Files

Zuheir would also like source position and nutation information in the Sinex files.

This should be a relatively small change.

Deadline for implementation:  30-Jun-2019

# Summary

Many software changes need to be made.

Most of these are pretty simple.

I think the hardest (due to bookkeeping) will be keeping track of pressure loading effects and writing to the Sinex files.

Tentative deadline is one year from now.

This should be doable for everyone.