

To: Ad Hoc Working Group on sub-daily EOP
From: John Gipson
Date: September 18, 2017
Re: Organization and next steps

An action item that came out of the GGOS/IERS Unified Analysis Workshop in Paris was the formation of an ad hoc working group on sub-daily EOP variation. For brevity, I will just refer to 'sub-daily EOP variation' as HF-EOP. If you receive this memo you are agreed to participate in such a working or I think that you might be interested in participating in this. The purpose of this email is to get the ball rolling.

To save myself from repeating this in the following sections, please let me if: You see any errors; You don't want to be on the mailing list; You think someone else should be; I have forgotten anything; etc.

Goals

The current IERS model for HF-EOP is 20 years old and was based on a simple tidal model at that time. Much has changed since then. We have several different models of HF-EOP, some empirical models and some derived from tidal models. The accuracy of the SGP has increased over the last 20 years, and we also have much more data. Several scientists have shown that some of the empirical models produce better results (in terms of reduced residuals, etc) than using the IERS model.

1. The goal of the ad hoc working is to have members of each Space Geodetic Technique evaluate several models of HF-EOP with the aim of determining which model(s) are 'best'.
2. It is the responsibility of members of each technique to come up with suitable metrics to determine best.
 - a. For example, in VLBI an internal metric is A) baseline scatter (less scatter is better), while an 'external' metric is comparison of VLBI measurements of PM with that of IGS.
 - b. In GNNS one metric is a reduction in the residuals. There may be others.
3. An initial task of the working group is to come up with a common set of models to test. To keep things reasonable, I suggest no more than 5-7. A list of possible models is given below.
4. After testing, the working group will make a recommendation to the IERS for a new model.

Models

Christian Bizouard suggested the following set of models. If you have any suggestions on this, please let me know. Should we remove some of these models? Should we add others?

1. Desai & Sibois model.
2. Madzak et al (2016): https://www.researchgate.net/publication/303988523_High-frequency_Earth_rotation_variations_deduced_from_altimetry-based_ocean_tides
3. Hagedoorn et al: SPOT: <https://agu.confex.com/agu/fm15/webprogram/Paper77114.html> (I got the electronic table)
4. FES 2014 (Florent Lyard, LEGOS)
5. Gipson model(s): ortho-tides / tidal lines.

I am omitting a model by Thomas Artz et al which is also based on VLBI data. The rationale is that this is superseded by the Gipson model which is based on more data.

Christian Bizouard suggested that the models could be placed on the IERS web-site which would make it easy for people to download. Christian also suggested that one option would be to just give the models

in terms of the amplitudes at the various tidal lines. If people are amenable to this, I am willing to provide a FORTRAN subroutine which will read in the models and calculate the HF-EOP at some epoch. Alternately people can develop their own software.

Libration Effects

The IERS model consists of two different parts:

1. Tidally induced HF-EOP
2. Libration effects. These are due to the gravitational torque on the tri-axial Earth.

The total HF-EOP is the sum of these two terms.

In evaluating HF-EOP it is important to be consistent. If one is using an empirical model and HF-EOP was not 'turned-on' in the derivation of the model, then you want to make sure that you don't model libration effects in your analysis.

Schedule

Below is a straw man schedule.

1. September 2017. Finalize organization of the working group.
2. September 2017-March 2018. Make comparisons.
3. December 2017. Richard Gross has asked that I make a presentation on the working group at the fall AGU. This will mostly be descriptive, but I will also discuss any results we have.
4. April 2018. Present results of tests at 2018 EGU meeting.
5. April 2018. Splinter meeting at the 2018 EGU to discuss recommendations to the IERS.
6. May 2018. Draft and submit recommendation to the IERS.

Members

The following scientists have agreed to participate in the working group. If you know of others that are interested, please let me know and I will add them to the list. The order is no particular list although I tried to group techniques together

Who	Where	Email	Technique
John Gipson	NASA/GSFC	John.M.Gipson@nasa.gov	VLBI/Chair
Hana Krasna	TU-Wien	Hana.Krasna@geo.tuwien.ac.at	VLBI
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Richard Gross	JPL	Richard.S.Gross@jpl.nasa.gov	'Ex Officio'