# SOME SYSTEMATIC ERRORS IN AAM AND OAM DATA

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ABSTRACT. Atmospheric Angular Momentum (AAM) and Ocean Angular Momentum (OAM) functions excite significant parts of the length of day (LOD) and polar motion variations and provide strong disturbances over the broad band of frequencies with periods from several days to years. The time series of AAM and OAM contain some systematic biases of the mean values for some periods due to unevenly spaced distribution of some observational stations in time. These biases are determined by analyses of the significant linear trends, longer than five years, in the integrated AAM and OAM functions. After estimated biases are removed from the AAM and OAM data, the resulting time series have good consistency in relation to the oscillations with periods from several days to five years. Their application yields a more precise estimation of the periodic terms of the Earth orientation parameters within this band.

## 1. AAM AND OAM DATA

The AAM and OAM functions for the period 1962.0-now are available via the server of Paris Observatory at http://hpiers.obspm.fr. These functions are based on the data provided by the U.S. National Centers for Environmental Prediction (NCEP) and NASA/JPL for ocean model ECCO JPL. The data in Figure 1 consist of IB-corrected matter terms and motion terms. The high-frequency daily variations are removed by normal points at 0.05 yr, estimated by the Danish method (Kubik, 1982; Kegel, 1987).

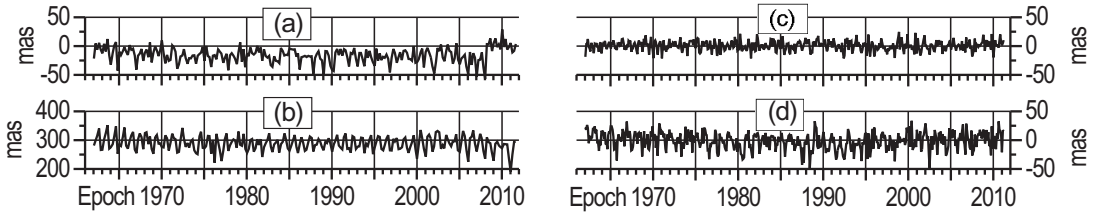


Figure 1: Normal points at 0.05 yr of $AAM_x$ - (a); $AAM_y$ - (b); $OAM_x$ - (c) and $OAM_y$ - (d).

## 2. AAM AND OAM INTEGRALS

The step-wise systematic biases of the mean in AAM and OAM excitation of LOD are determined in Chapanov and Gambis (2008) by the linear trends in the corresponding excitation functions of UT1. A similar approach is used here. The $x$ and $y$ time series of atmospheric and oceanic excitation of polar motion are integrated (Figure 2). The linear trends with different inclinations correspond to significant biases of the mean values of the AAM and OAM series.

## 3. SYSTEMATIC ERRORS IN AAM AND OAM

The systematic biases of the mean of $x$ and $y$ AAM and OAM series are illustrated in Figure 3, where the original data are replaced by smoothed time series, determined by Vondrak (1969) filtering. The time interval of each step corresponds to the time intervals of linear trends of the integrated time series from Figure 2. The difference between the maximal and minimal biases of $AAM_x$ is 22.2 mas; $AAM_y$ - 24.2 mas; $OAM_x$ - 3.6 mas and $OAM_y$ - 9.0mas (Table 1).

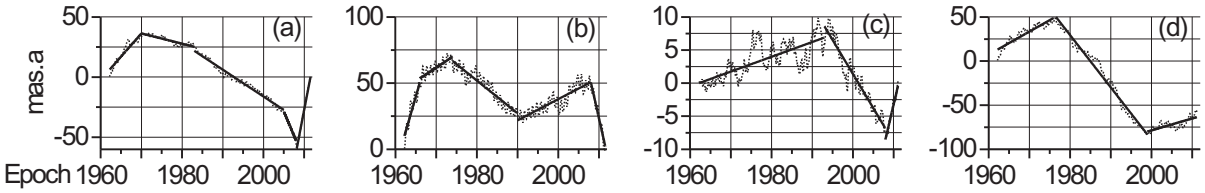


Figure 2: Integrals (in dots) of $AAM_x$ - (a); $AAM_y$ - (b); $OAM_x$ - (c); $OAM_y$ - (d) and linear trends.

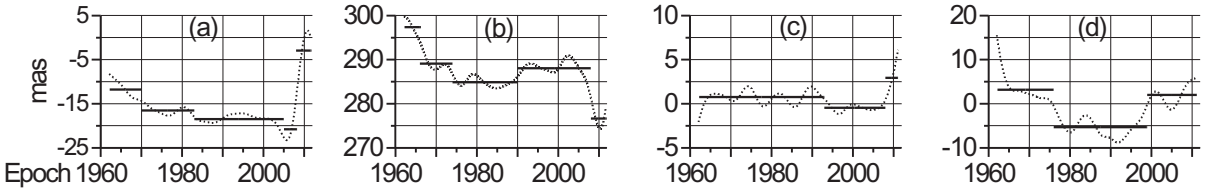


Figure 3: Step-wise biases of smoothed $AAM_x$ - (a); $AAM_y$ - (b); $OAM_x$ - (c) and $OAM_y$ - (d).

## 4. CONCLUSIONS

The systematic biases of the mean of AAM and OAM excitation functions are determined by a numerical integration of the corresponding normal points of $x$ and $y$ components at 0.05 yr intervals and by a removal of the linear trends from the resulting time series. The AAM time series contain five parts with significant systematic biases and the OAM time series contain three parts. The original AAM and OAM time series reveal step-wise behavior of the mean value due to variable number of used instruments and relatively small systematic deviations from the total mean value for some intervals with duration from 3–15 yr. The maximal effects of the determined biases on the $x$ and $y$ components of AAM variations are 22.2 mas and 24.2 mas, and on the OAM variations 3.6 mas and 9.0 mas. It is possible to improve the quality and accuracy of scientific investigations of Earth Orientation Parameters variations by removing the systematic biases of the mean of AAM and OAM excitation functions.

| Time interval | $AAM_x$ | Time interval | $AAM_y$ | Time interval | $OAM_x$ | Time interval | $OAM_y$ |
|---|---|---|---|---|---|---|---|
| 1962.0–1970.0 | +4.24 | 1962.0–1966.0 | +11.40 | 1962.0–1993.0 | +0.15 | 1962.0–1976.0 | +4.45 |
| 1970.0–1983.0 | –0.67 | 1966.0–1974.0 | +2.40 | 1993.0–2008.0 | –0.89 | 1976.0–1999.0 | –4.45 |
| 1983.0–2005.0 | –2.44 | 1974.0–1990.0 | –2.34 | 2008.0–2011.7 | +2.69 | 1999.0–2011.7 | +3.28 |
| 2005.0–2008.0 | –7.99 | 1990.0–2008.0 | +1.15 | | | | |
| 2008.0–2011.7 | +14.20 | 2008.0–2011.7 | –12.83 | | | | |

Table 1: Systematic biases of excitation due to AAM and OAM for some intervals.

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## 5. REFERENCES

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