

The Special Bureau for the Oceans: Status and Ideas for Change

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International Earth Rotation Service

Special Bureau for the Oceans

WELCOME

Welcome to the IERS Special Bureau for the Oceans home page!

The oceans have a major impact on global geophysical processes of the Earth. Non-tidal changes in oceanic currents and ocean-bottom pressure have been shown to be a major source of polar motion excitation and also measurably change the length of the day. The changing mass distribution of the oceans causes the Earth's gravitational field to change and causes the center-of-mass of the oceans to change which in turn causes the center-of-mass of the solid Earth to change. The changing mass distribution of the oceans also changes the load on the oceanic crust, thereby affecting both the vertical and horizontal position of observing stations located near the oceans. Recognizing the important role that non-tidal oceanic processes play in Earth rotation dynamics and terrestrial reference frame definition, the International Earth Rotation Service ([IERS](#)) has recently created a Special Bureau for the Oceans in order to facilitate research into these and other solid Earth geophysical processes affected by the oceans.

The IERS Special Bureau for the Oceans (SBO) is one of seven Special Bureaus of the IERS Global Geophysical Fluids Center ([GGFC](#)) which was established on January 1, 1998 in order to help relate dynamical properties of the atmosphere, oceans, mantle, and core to motions of the Earth, including its rotation. In particular, the IERS Special Bureau for the Oceans is responsible for collecting, calculating, analyzing, archiving, and distributing data relating to non-tidal changes in oceanic processes affecting the Earth's rotation, deformation, gravitational field, and geocenter.

Through the IERS SBO web site, oceanic [data](#) can be downloaded and a [bibliography](#) of publications pertaining to the effect of the oceans on the solid Earth can be obtained. Additional information about the IERS Special Bureau for the Oceans can be found in the [SBO chapter](#) of the IERS Technical Note on the Global Geophysical Fluids Center.

Members of the IERS SBO Team

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DATA

The IERS SBO data archive is also accessible by anonymous ftp to [euler.jpl.nasa.gov/sbo](ftp://euler.jpl.nasa.gov/sbo)

Global Oceanic Angular Momentum

<u>Name</u>	<u>Ocean Model</u>	<u>Data Span</u>	<u>Resolution</u>
ponte98.oam	MIT	Jan 1985 to Apr 1996	5 days
johnson99.warning	POCM_4B	Jan 1990 to Dec 1993	15 days
johnson01.oam	POCM_4B	Jan 1988 to Dec 1997	3 days
c20010701.oam	ECCO	Jan 1980 to Mar 2002	1 day
ECCO_50yr.oam	ECCO	Jan 1949 to Dec 2002	10 days
ECCO_kf049f.oam	ECCO	Jan 1993 to Mar 2006	1 day

Oceanic Center-of-Mass

<u>Name</u>	<u>Ocean Model</u>	<u>Data Span</u>	<u>Resolution</u>
dong97_mom.cm	MOM	Feb 1992 to Dec 1994	3 days
dong97_micom.cm	MICOM	Feb 1992 to Dec 1994	3 days
c20010701.cm	ECCO	Jan 1980 to Mar 2002	1 day
ECCO_50yr.cm	ECCO	Jan 1949 to Dec 2002	10 days
ECCO_kf049f.cm	ECCO	Jan 1993 to Mar 2006	1 day

Ocean-Bottom Pressure (Modeled)

<u>Name</u>	<u>Ocean Model</u>	<u>Data Span</u>	<u>Resolution</u>
ECCO simulation	MIT	Jan 1980 to present	12 hours
ECCO assimilation	data assimilated	Jan 1993 to present	12 hours

Ocean-Bottom Pressure (Measured)

GLOUP (GLObal Undersea Pressure) data bank of ocean-bottom pressure measurements

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SOFTWARE

- [calc_sbo2.f](#) Fortran routine to calculate core SBO products from modeled oceanic velocity and density fields

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PUBLICATIONS

- [Description](#) of the IERS Special Bureau for the Oceans (PDF file)
- [Bibliography](#) of publications pertaining to the effect of the oceans on the solid Earth (PDF file)

PDF files can be read with Adobe [Acrobat Reader](#) which is available at no cost from [Adobe](#)

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Example Data Set

File name : ECCO_50yr.oam
File contents : Global oceanic angular momentum mass and motion terms
File units : kg-m**2/s

Reference : Gross et al., Atmospheric and Oceanic Excitation of Decadal-Scale Earth
: Orientation Variations, J. Geophys. Res., submitted, 2004

Contact : Richard Gross, Richard.Gross@jpl.nasa.gov

Temporal domain : January 1949 through December 2002
Temporal resolution : 10-day averages
Number of data records : 1998

Ocean model : ECCO (based on MITgcm)
Horizontal domain : 78 degrees South to 80 degrees North latitude
Horizontal resolution : 1/3 degree at equator to 1 degree at high latitudes by 1 degree longitude
Vertical resolution : 46 levels ranging in thickness from 10 m at surface to 400 m at depth
Boussinesq model? : Yes
Tabulated mass term corrected for volume changes due to steric effects? : Yes

Ocean model forcing :
Surface wind stress : 12-hour NCEP/NCAR reanalysis
Surface heat flux : Daily NCEP/NCAR reanalysis
Surface freshwater flux : Daily NCEP/NCAR reanalysis (freshening only)
Surface pressure : None

Data assimilated : None

Notes : 1. The tabulated date corresponds to the midpoint of the 10-day-long averaging interval.

2. The tabulated values are not equi-spaced in time since the output epoch is re-set at the beginning of each calendar year.

3. The mean has been removed from the tabulated OAM values.

The mean OAM mass term (kg-m**2/s; x,y,z) = 1.33217988E+29 1.04409649E+29 2.94018843E+30
The mean OAM motion term (kg-m**2/s; x,y,z) = -8.55664733E+23 3.02823386E+23 1.13950206E+25

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MJD	OAM mass (ocean-bottom pressure) term, kg-m**2/s			OAM motion (current) term, kg-m**2/s		
	x-component	y-component	z-component	x-component	y-component	z-component
32922.00	9.10868396E+23	-1.78333637E+21	-6.22055507E+23	-5.97660429E+23	1.05461345E+22	-1.33149835E+23
32932.00	5.53438979E+23	-5.57363105E+23	-8.26087171E+23	-5.84533534E+23	-3.47642358E+23	5.98747406E+23
32942.00	7.03238789E+23	8.70950571E+22	-1.73571950E+24	-4.91700821E+23	-3.39641552E+23	4.42609148E+23
32952.00	3.77513042E+23	-6.11179261E+22	-2.96754028E+24	-6.98410997E+23	-2.93335047E+23	-2.67243746E+23

Guiding Principles

- Provide fundamental, not derived, quantities
 - Oceanic angular momentum, not excitation functions
 - Center-of-mass of oceans, not geocenter
 - In standard format
- Provide description of each data set (metadata)
 - Include in file header
- Provide background documentation
 - Description of SBO and its products
 - Bibliography of relevant publications
- Provide software
 - To compute SBO products from OGCMs

Future Improvements

- New and improved products
 - From more accurate ocean models
 - Data assimilating
 - Higher spatial and temporal resolution
 - Non-Boussinesq (mass not volume conserving)
 - Real-time and predicted
 - Support EOP predictions
 - Including torques
- New and improved web server
 - Interactive analysis of data sets

Issues and Concerns

- Unfunded activity
 - Start-up funds were provided
 - Host organization provides infrastructure support
 - No funds available for operations/maintenance
 - SBO web and ftp servers maintained by volunteers
 - Difficult to develop new capabilities such as online analysis tools
 - Data sets submitted to SBO by volunteers
 - Archive does not grow without new submissions
 - Submissions reflect activity in field

New Structure

- Would not address concern about funding
 - Funding issues need to be addressed separately
- Should build on existing structure
 - Retain interest and expertise of those currently involved
 - GGFC products most naturally computed on fluid by fluid basis
- Proposal:
 - Retain existing structure of fluid-based SBs
 - SBs should be re-competed
 - Create new portal to and seamless archive of GGFC products
 - User able to access all GGFC products through this single portal
 - To be located at GGFC Central Bureau