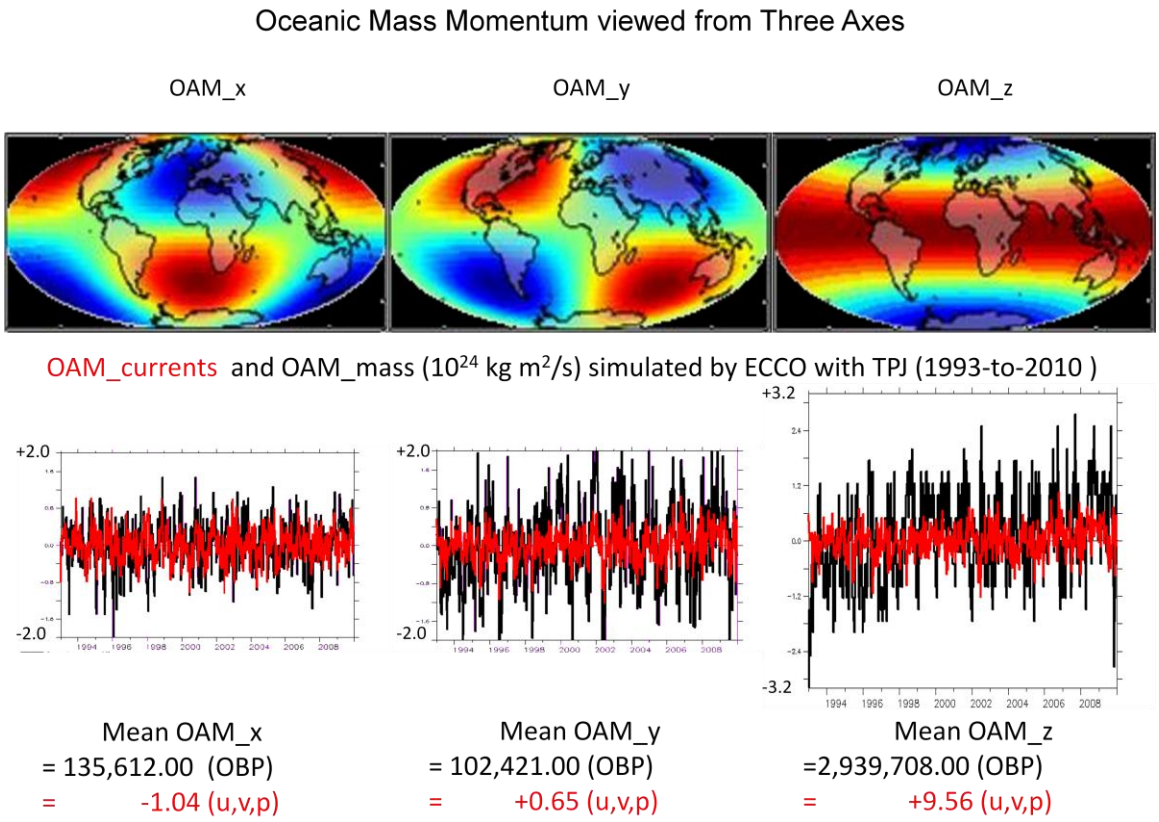

For **OAM, OBP, AAM, LOD** see list of Acronyms and Definitions

Three maps (top row) illustrating how the oceanic mass distribution contributes to the OAM time series relative to each of the three axes (middle row) and their mean values from 1993-2010 for OAM_mass and OAM_current (bottom row).
Angular momentum values are counted in units of 10^{24} kg m^2/s.

*The two equatorial axes chosen here are the Greenwich axis (OAM_x) and the 90º axis (OAM_y). The middle row time series represent the angular momentum of **masses (black)**. For reference, the angular momentum of **currents** is overplotted **(red)**. The **ocean mass** distribution contributes to the variations of OAM_y and OAM_z more than do **currents**. This is strikingly different from the atmosphere in which winds contribute 95% to 97% of the AAM_z variations. This is because the atmospheric surface pressure is equivalent to only 10 meters thick of water while the averaged ocean depth is 4000m. Ocean water masses can equally be distributed between the southern and northern hemispheres in the Atlantic and central Pacific (OAM_y). **Currents** and **masses** have equal contributions to OAM_x because OBP variations are blocked by continents in the North Indian Ocean. OAMs are efficient tools to make progress in understanding the link between earth wobbles and the conveyor belt because they provide an angular view of the three-dimensional general circulation that is complementary to the "β-plane" approximation. The latter, which is valid to a great extent over most of the oceanic surface in the tropics up to mid-latitudes, works well in GCMs to reproduce the zonal components of the oceanic and atmospheric circulations in the three tropical basins and troposphere relative to their permanent density profiles.*

*Each of the mean values of **OAM_currents** in the bottom row has a meaningful sign for the circulation relative to the earth rotation. The positive OAM_z corresponds to the eastward Antarctic Circumpolar Current, the negative OAM_x is mostly due to the portion of the conveyor belt that flows from the NorthWest Pacific to the South Atlantic through the Indian Ocean. The **OAM_mass** mean values are all positive because of the location of the continents with the oceanic mass center located at 10ºS in the Pacific. OAM_x has 30% more angular momentum than OAM_y because of the presence of continents. The biggest ocean angular momentum of all is OAM_z. It is due to the tropical **ocean mass** which is bigger by a factor 22 at least than the other two momentum of **mass**. During El Niño warm events, the trade winds relax associated with a weakening of the tropical Pacific system of currents and counter-currents along the equator, meaning that the LOD or OAM_z increase. But how this zonal change of the coupled ocean-atmosphere system affects the meridional circulation of the oceans and the Hadley circulation of the atmosphere is poorly known. It is crucial to provide the mean values of the OAM time series to understand the relationship between **circulations** and **masses**. The biggest uncertainty is **mass**.*