In February 2010, the tongue of the Mertz Glacier calved, releasing an 80x30km iceberg. We had anticipated this calving event and started observing its development as well as gathering data to monitor the dynamics of the glacier upstream. Here, we present the main characteristics of Mertz Glacier in the context of this calving event. In addition to regular collection of satellite images and altimetry data, a number of observations have been made within the CRACICE-Mertz project and more generally under the framework of the IPY. For investigations of the glacier dynamics and rift development we have used the following data types: ERS SAR interferometry, RADARSAT and ENVISAT SAR images, LANDSAT and SPOT images, SPOT stereo imagery, airborne ice thickness radar profiles and in situ GPS measurements. We also improved the ocean bathymetry data set using airborne gravimetry, iceberg movements and grounding points, and new bathymetric soundings. We use numerical model studies to integrate and compare the various derived information. We compare the basal melt / freeze rates derived from an ice/ocean model (ROMS), with that from mass balance of the glacier tongue. We use the ocean circulation in the Mertz region derived from a barotropic model (TUGO) together with continuous GPS measurements of the movement and flexure of the ice tongue, to assess the response of the glacier tongue to ocean forcing. They are found to be the main driver of the rifting and calving. We describe the sequence of events in the calving process.