In the area to the east of Mertz Glacier in East Antarctica, sea ice forms and often remains for many years. It is typically held in place by grounded icebergs and attached to the coastline to form large expanses of fast ice. In some cases the fast ice has remained in place for decades and attained a great thickness of tens of metres. This ice comprises a regional freshwater reservoir that can, importantly, influence upper-ocean salinity when the ice is exported and melted. It is a source of very thick multi-year sea ice sometimes observed within the Seasonal Sea Ice Zone about East Antarctica. The thickness distribution of this ice is derived using a density profile and measurements of the freeboard height of the surface of the floes by the SIRAL radar altimeter on the European Space Agency’s CryoSat-2 satellite. Snow accumulation rates are expected to be in excess of 1000 kg m\(^{-2}\) a\(^{-1}\) as indicated by analysis of firn cores from nearby icebergs, B09B and C08. This suggests that the freeboard layers are composed of snow, from which we infer an appropriate density profile. Shipboard observations of these very thick floes support this assessment. We use these estimates of thickness to characterise the ice thickness distribution in the area. In mid-2010, this very thick ice comprised a number of very large continuous / semi-continuous expanses. Late in 2010, some areas fractured and broke into many small sections and a fraction of the thick ice was exported from the area.