This manuscript introduces a new global top-down NEE data from 2010 and 2019 produced by GCASv2 assimilating with a new ACOS GOSAT XCO2 L2 data. The data has been well validated by ground based and aircraft in-situ measurement that provide from OBSPACKv6. Further studies on comparison with GCP data descripts clear in this manuscript. The detail of dataset, e.g. interannual variations, trend, and profile performance is introduced. This manuscript, overall, is well written and organized, and detail is enough for potential readers and data users. I recommend it for publication, but a minor revision is required.

Line 100, the gridding method is not clear, would suggest adding some equation description.

Line 155, please state the ‘a global ocean circulation and biogeochemistry model’

Line 225 and Global carbon budgets, the different between top-down estimation NBE and AGR of GCASv2 and GCP2020 comes from LULUC. I would like to indicate the average significant on this different, otherwise the improvement compared a prior and posterior is not clear.

Line 237, ‘In N. America, the distribution of NEE constraint with GOSAT XCO2 agrees well with a recent regional inversion using surface CO2 and 14CO2 measurements, which also shown significant sources over western US and sinks over central and eastern US (Basu et
al., 2020).’ Please revise this presentation to avoid over-estimation on the ability of your inversion and GOSAT XCO2 measurement.

Line 265, it seems CMS-Flux using two satellites measurement in their study, incl. GOSAT and OCO-2 comes from different retrieval. The statement of measurement is not clear, e.g. satellite, retrieval algorithm and version, please revise.

Line 387, what is that ‘absolute errors’ mean?

Fig.9, this comparison method is not clear.