Global Climate Dynamics, Summer term 2016
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Exercises series 2
Due 12 May 2016

1. Albedo

(a) Plot the zonal mean, climatological mean all-sky albedo[1] of the Earth as observed from satellite!
(b) Compare this to the albedo for clear-sky conditions!
(c) How much energy does the system gain in the Tropics (30°S – 30°N) in one year in the solar? By how much would this heat the ocean to a depth of 100 m if it covered the entire Tropics?
(d) How much would it gain if there were no clouds?

2. The outgoing terrestrial radiation

(a) Plot the zonal mean, climatological mean all-sky outgoing terrestrial radiation of the Earth as observed from satellite!
(b) Compare this to the cases without clouds!
(c) What is the net loss in terrestrial radiation in the Tropics in one year?
(d) What would be the case if there were no clouds?

1 The observations from the Clouds and the Earth's Radiant Energy System (CERES) satellite instrument (http://ceres.larc.nasa.gov) are as climatological means available in /home_local/quaas/data/CERES_EBAF_*__9999.nc, where lwup is the terrestrial outgoing, swinc the solar incoming, swup the solar reflected, and net the net radiation flux density. "cre" is for "cloud radiative effect", the all sky minus clear sky fluxes, and "clr" for clear-sky fluxes (counting only pixels with no clouds present).