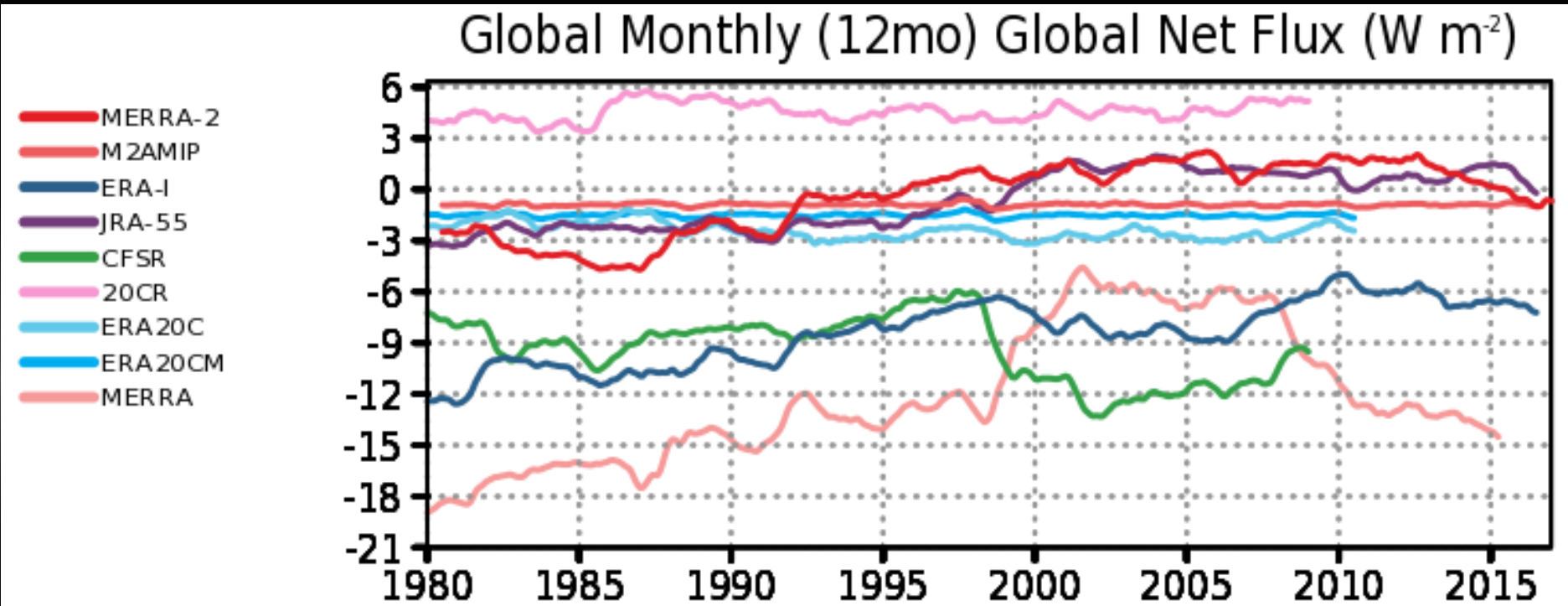


Evaluating the Net Global Energy in Reanalyses

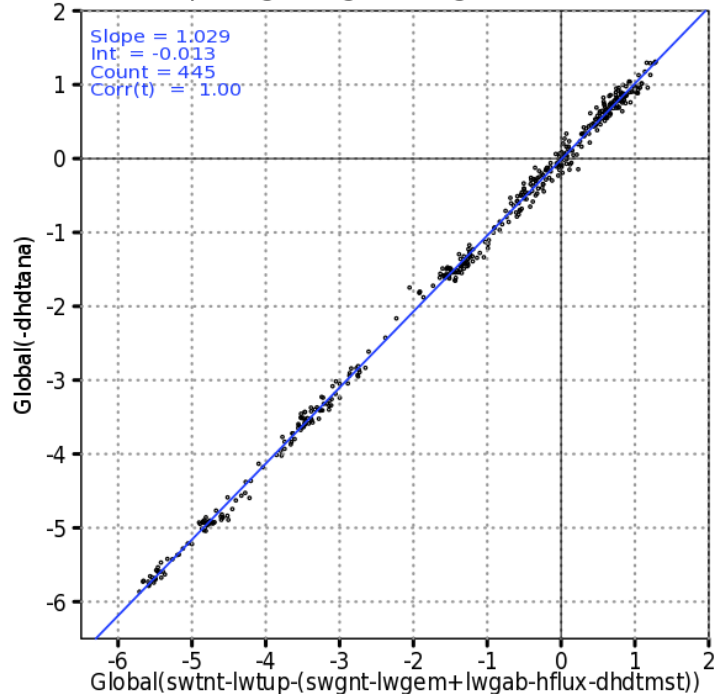
Reanalysis Net Global Energy Flux



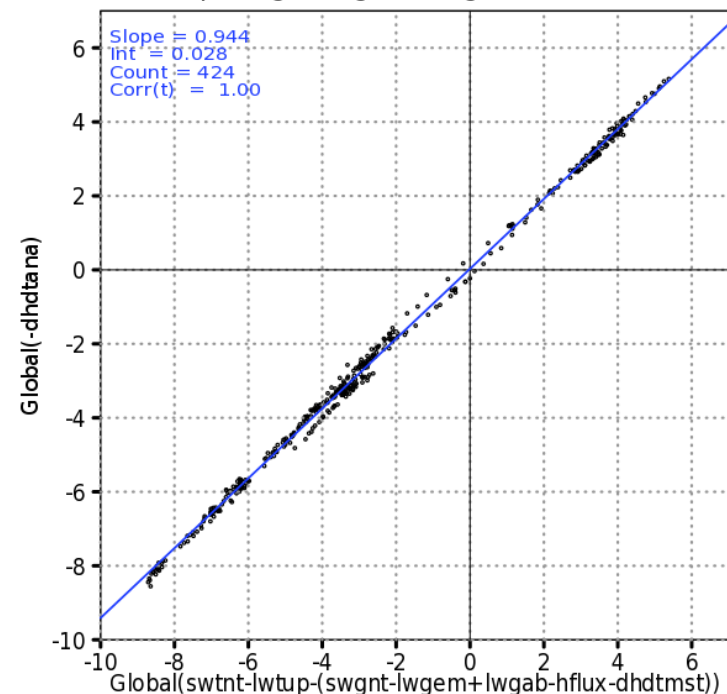
Global Net = TOA Net Down – Sfc Net Down

MERRA and MERRA-2 comparison to Analysis Increment

MERRA2 swtnt-lwtup-(swgnt-lwgem+lwgab-hflux-dhdtmst) 1980-2017



MERRA swtnt-lwtup-(swgnt-lwgem+lwgab-hflux-dhdtmst) 1980-2017



MERRA-2 and MERRA Analysis Increments balance the Global Net to 1 and 0.5 W/m² respectively (checking latent heat of melting snow is included)

Does the Residual = Analysis forcing?

- For MERRA and MERRA-2, fluxes can be closed, analysis increment is written diagnostic output
- The Models are not balancing, where is the missing energy?
 - What terms may yet need be included, or what have I misunderstood about the data?
- Ultimately, can this be used to intercompare the analysis forcing among reanalyses? Does it work for spatial distributions?

Global Net Flux Calculations

- MERRA-2 $\text{swtnt-lwtup}-(\text{swgnt-lwgem}+\text{lwgab-hflux-dhdtmst})$
- M2AMIP $\text{swtnt.2-lwtup.2}-(\text{swgnt.2-lwgem.2}+\text{lwgab.2-hflux.2-dhdtmst.2})$
- ERA-I $(-\text{ssr.3-str.3-slfh.3-sshf.3+tsr.3+ttr.3})$
- JRA-55 $-(\text{dswrfsfc.4+dlwrfsfc.4-ulwrfsfc.4-uswrfsfc.4-shtflsfc.4-lhtflsfc.4})+(\text{dswrftoa.4-uswrftoa.4-ulwrftoa.4})$
- CFSR $-(\text{dswrfsfc.5+dlwrfsfc.5-ulwrfsfc.5-uswrfsfc.5-shtflsfc.5-lhtflsfc.5})+(\text{dswrftoa.5-uswrftoa.5-ulwrftoa.5})$
- 20CR **dswrftoa.5**-rsut.6-rlut.6-(rsds.6+rlds.6-rsus.6-rlus.6-hfls.6-hfss.6)
- ERA20C $(-\text{ssr.7-str.7-slfh.7-sshf.7+tsr.7+ttr.7})$
- ERA20CM $(-\text{ssr.8-str.8-slfh.8-sshf.8+tsr.8+ttr.8})$
- MERRA $\text{swtnt.9-lwtup.9}-(\text{swgnt.9-lwgem.9+lwgab.9-hflux.9-dhdtmst.9})$