Cosine Zenith Angle Calculation Jan 2020

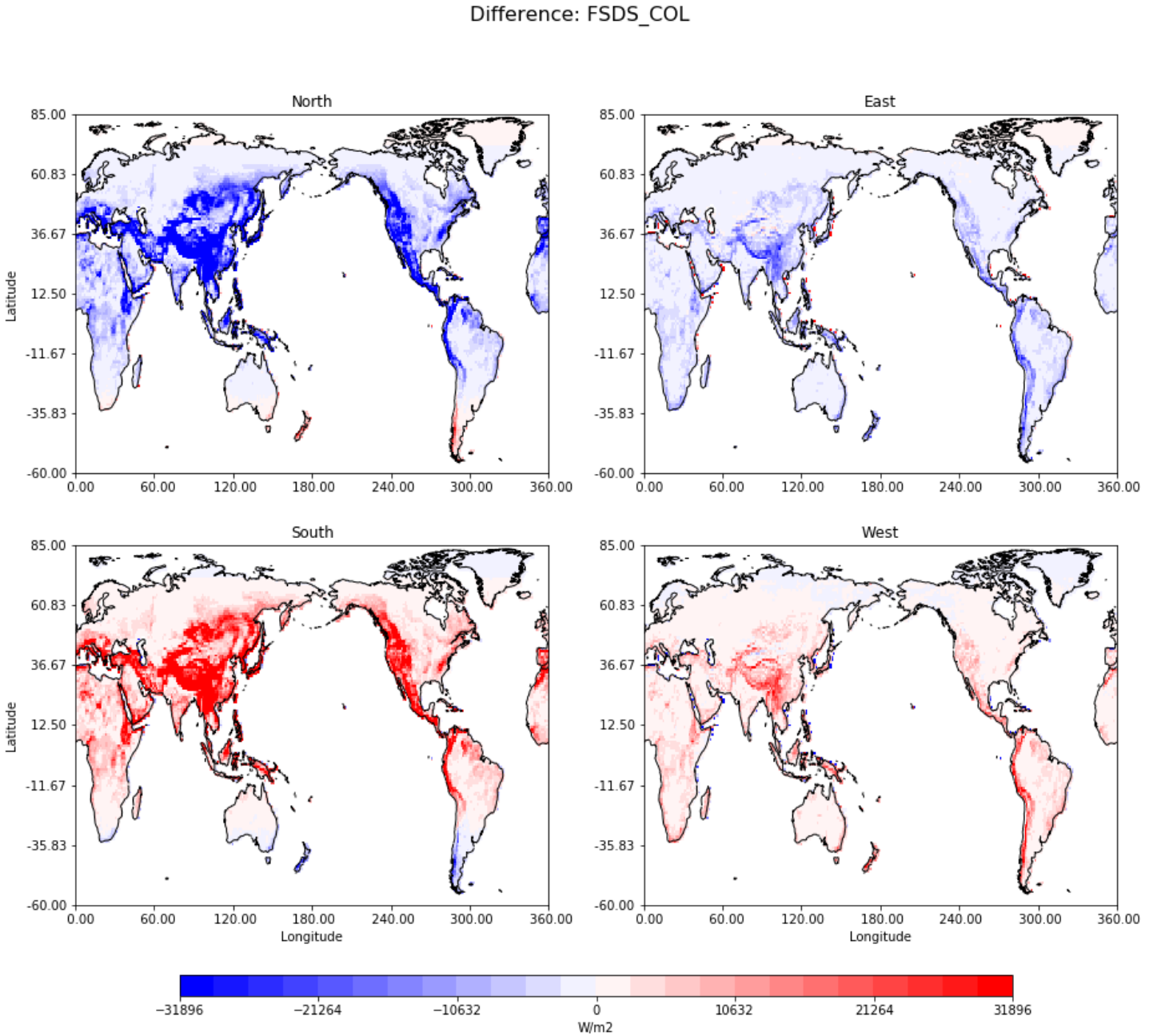
Cosine Solar Zenith Angle Calculation

CTSM uses a cos(zen) interpolation scheme to distribute solar forcing data at coarse temporal resolution (e.g 6- or 3-hourly) across the diurnal (diel) cycle.

Comparing hillslopes with different aspects shows an east/west difference in solar forcing, but this should be the same when averaging over time period longer than daily.

It appears that the interpolated solar forcing is being shifted by a timestep relative to the original forcing data.

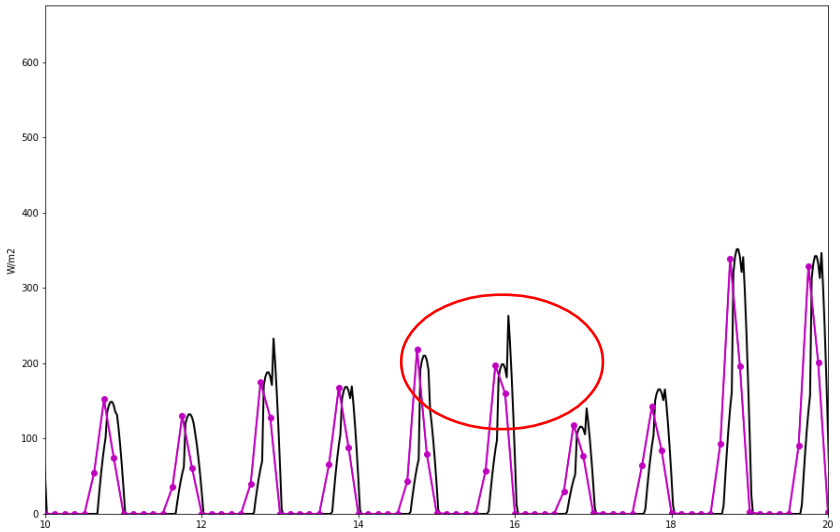
CTRL: Solar difference for different aspects



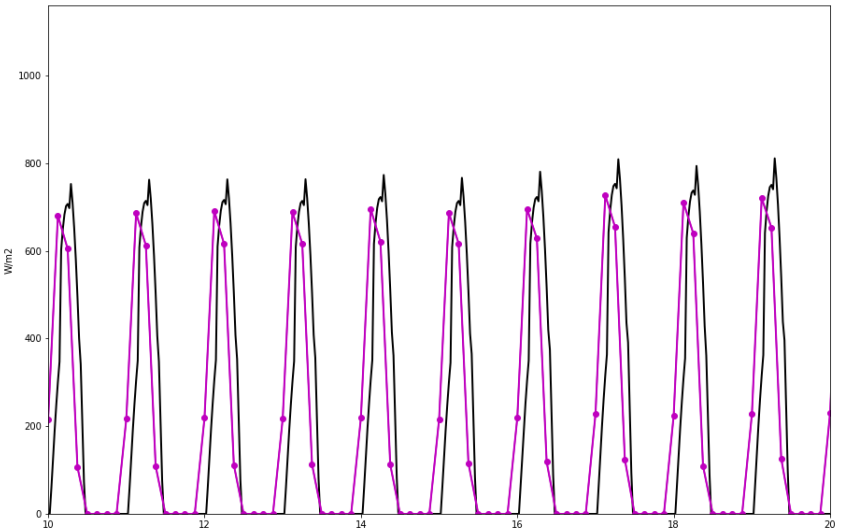
Difference in monthly average FSDS relative to gridcell average.

N/S makes sense, but E/W should be close to zero for monthly average.

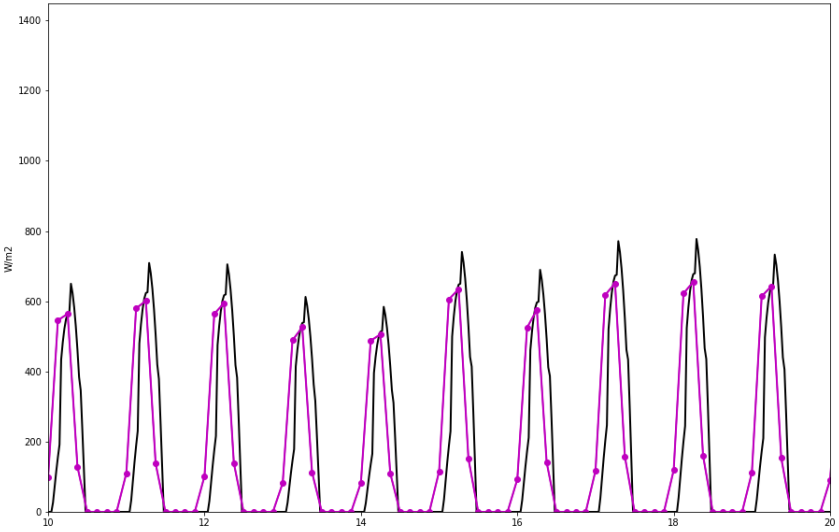
FSDS_COL [W/m2] Lon: 243.75 \ Lat: 47.59 (western US) Col 5



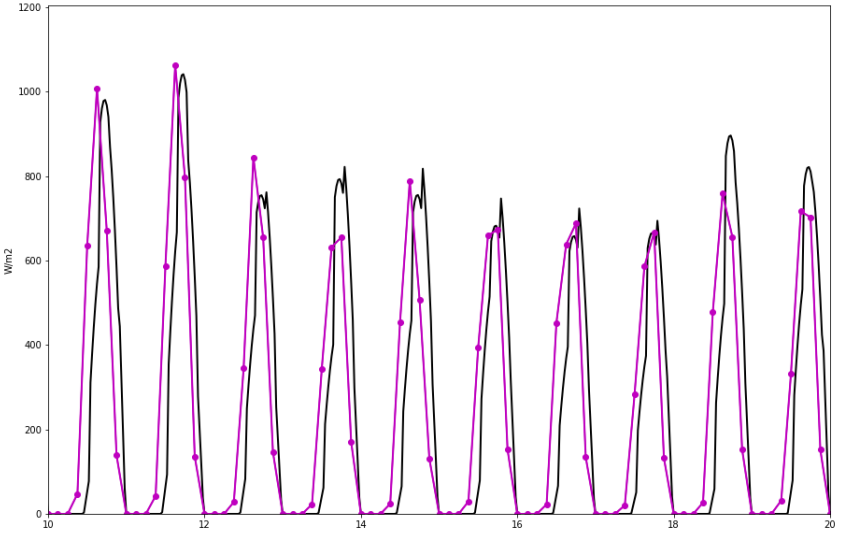
FSDS_COL [W/m2] Lon: 98.75 \ Lat: 23.09 (SE Asia) Col 5



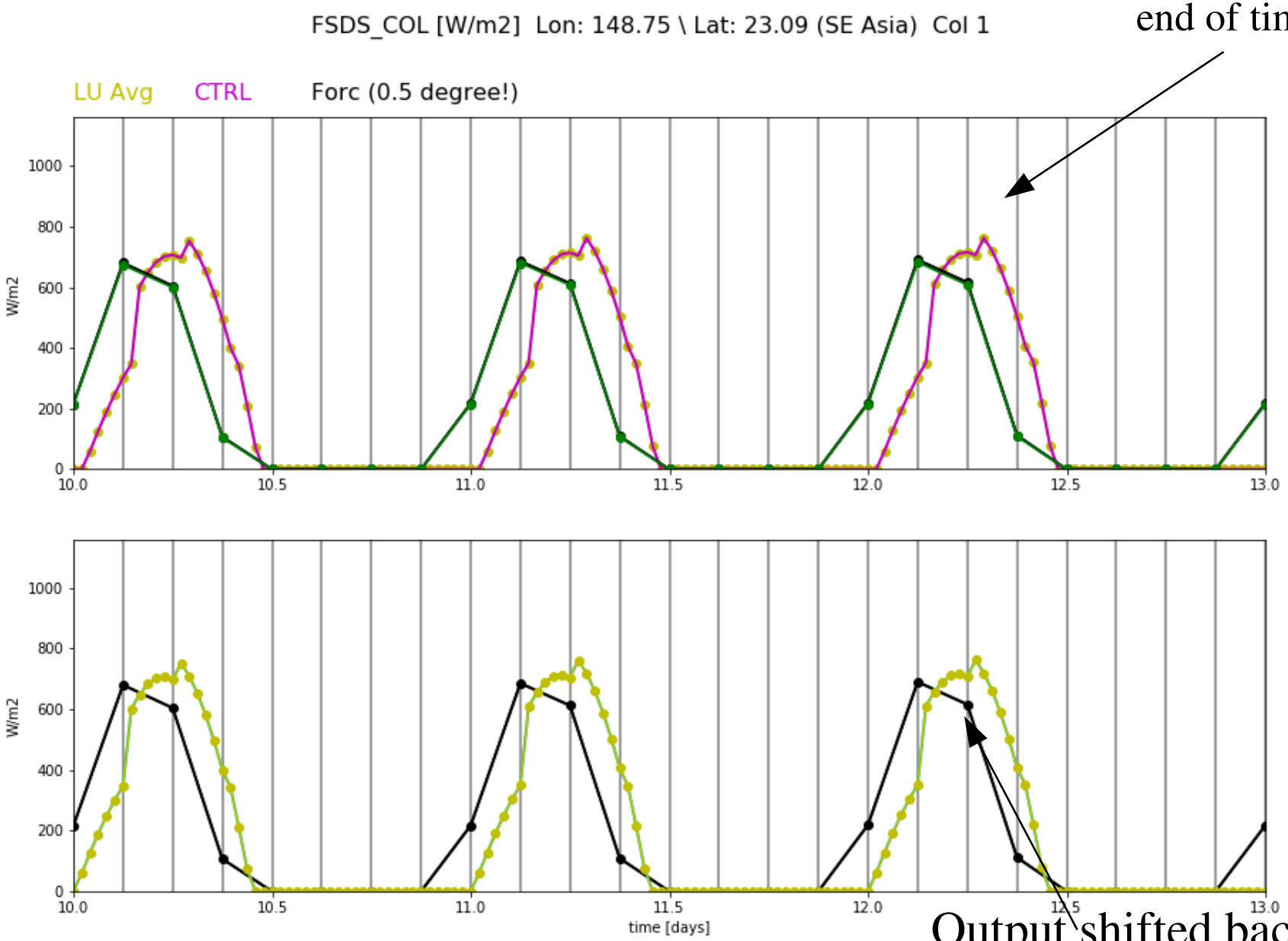
FSDS_COL [W/m2] Lon: 92.50 \ Lat: 29.69 (himalaya) Col 5



FSDS_COL [W/m2] Lon: 287.50 \ Lat: -14.61 (andes) Col 5



CTRL

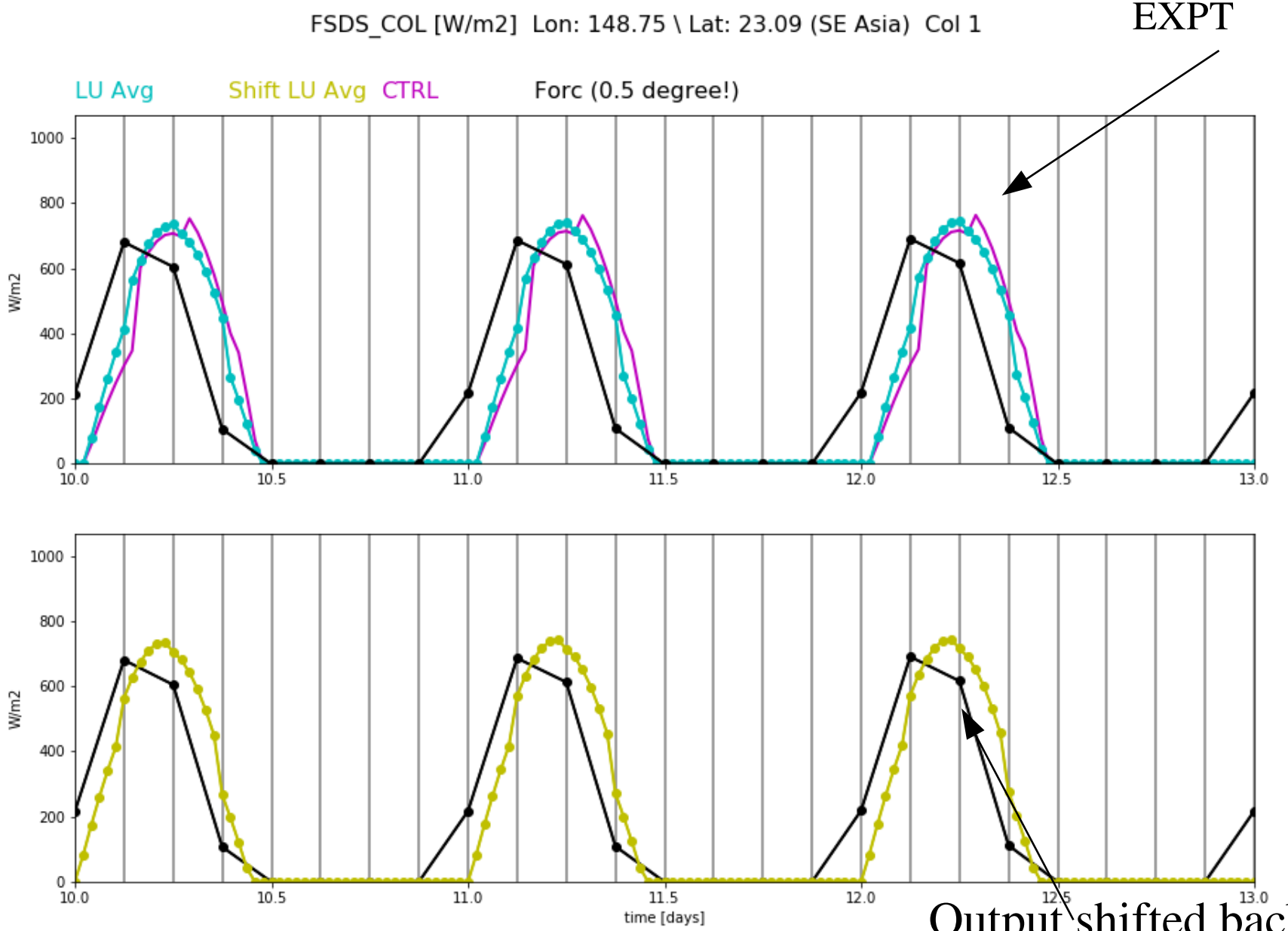


Input identified by beginning of time period, output by end of time period

Output shifted back 1 timestep still not aligned w/ input

EXPT: offset solar stream -1800 sec

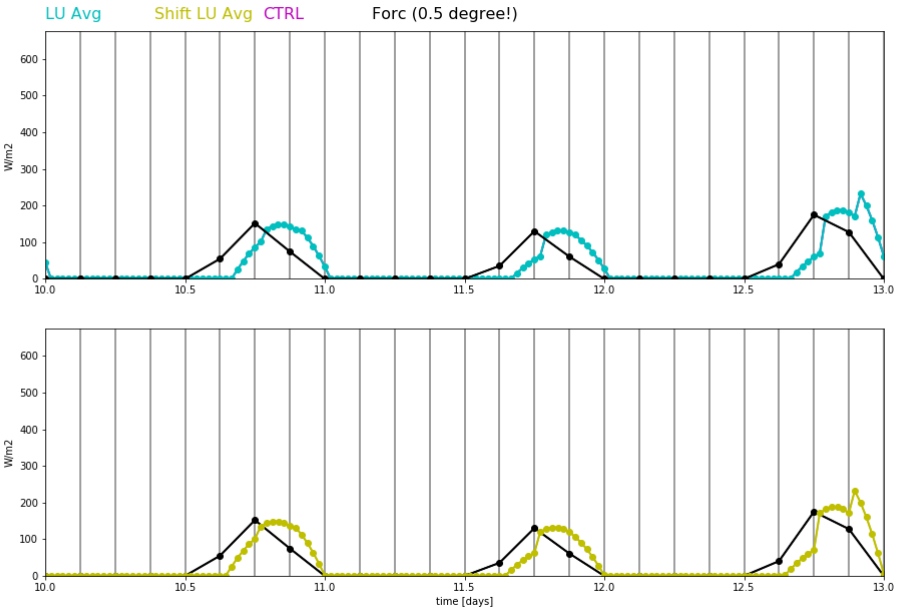
Shoulder spike is absent and diurnal cycle is smoother in EXPT



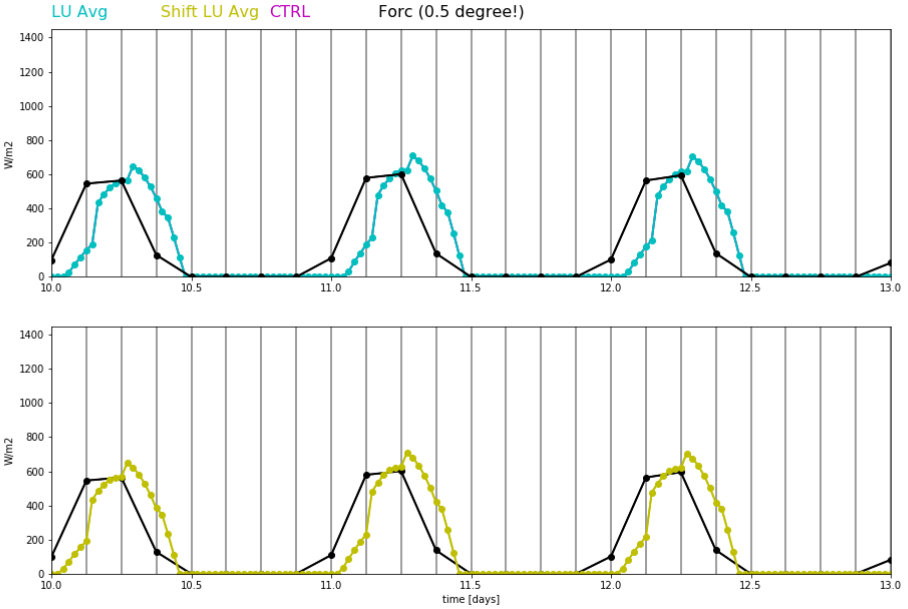
Output shifted back 1 timestep looks aligned w/ input

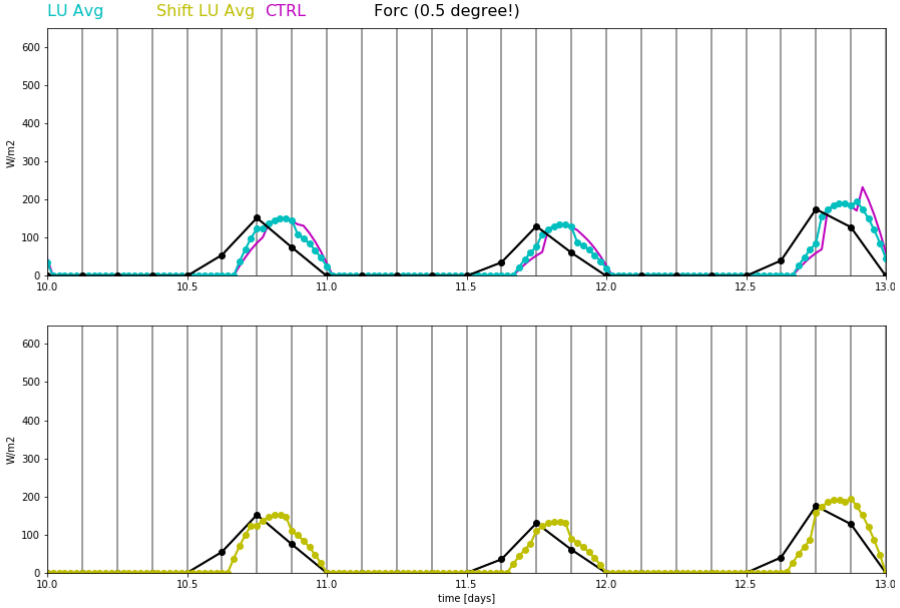
other points

FSDS_COL [W/m2] Lon: 243.75 \ Lat: 47.59 (western US) Col 1

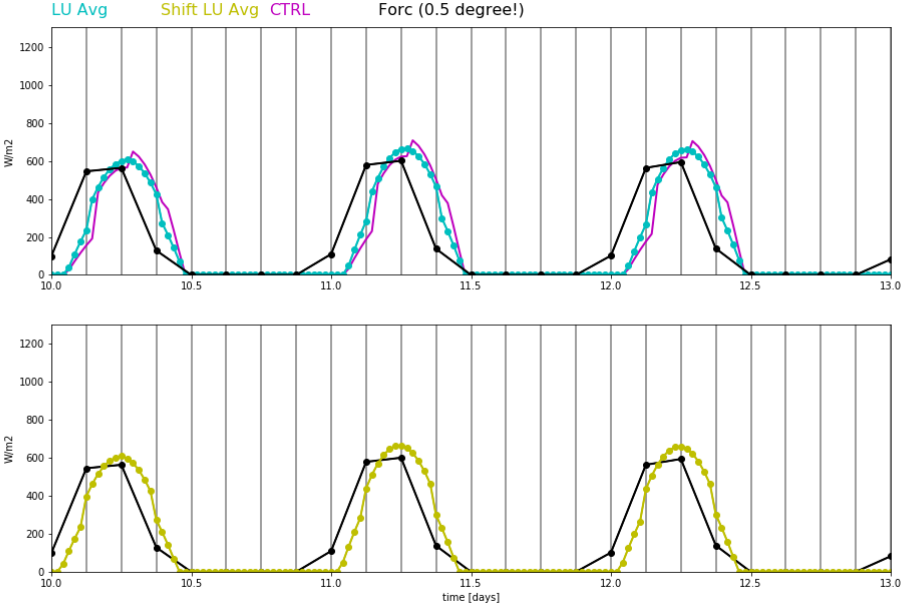


FSDS_COL [W/m2] Lon: 92.50 \ Lat: 29.69 (himalaya) Col 1

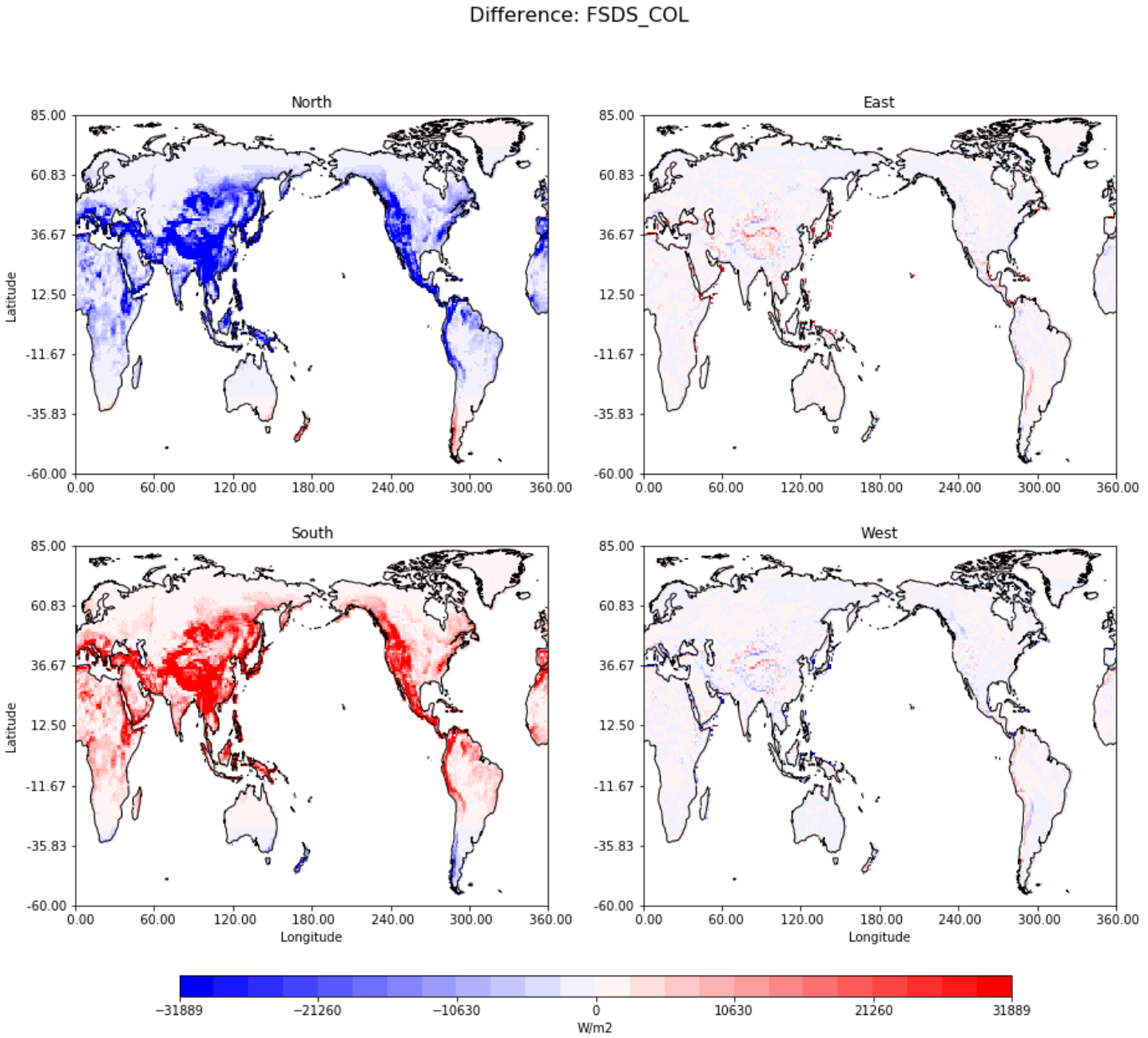




FSDS_COL [W/m2] Lon: 92.50 \ Lat: 29.69 (himalaya) Col 1



EXPT: Solar difference for different aspects



Difference in monthly average FSDS relative to gridcell average.

Now E/W is near zero.