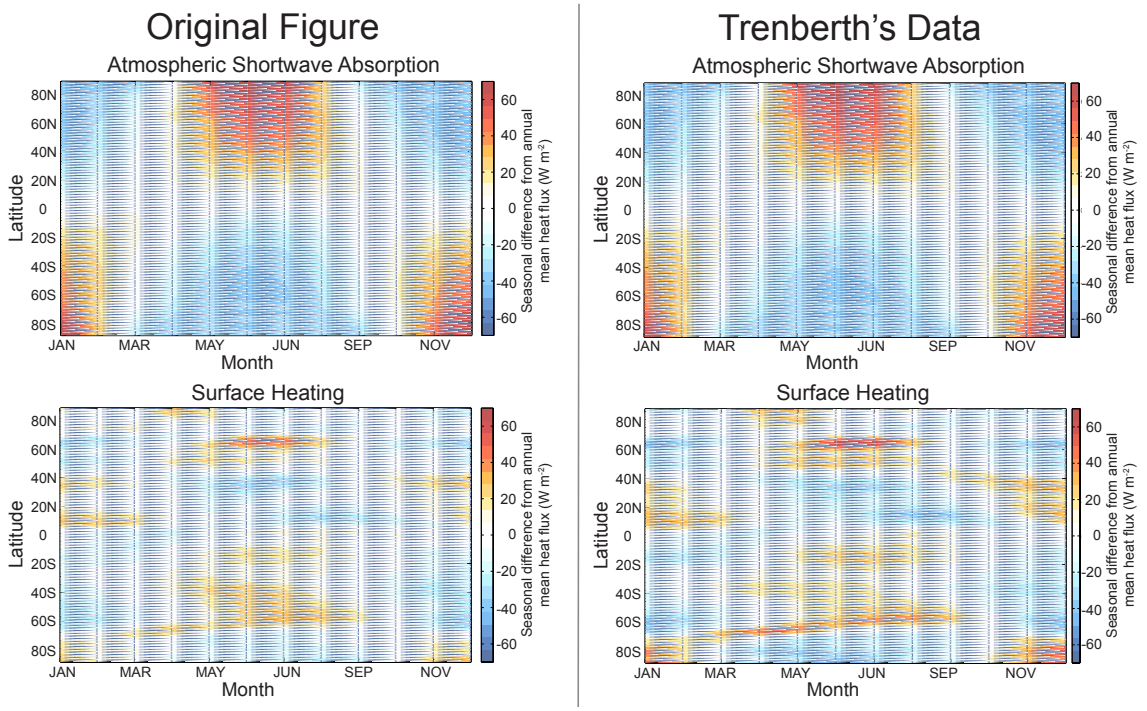

Figure 1: Observed zonal mean seasonal cycle of atmospheric heating by atmospheric solar absorption ($SWABS$ – top panels) and by upward surface heat fluxes (SHF – bottom panels) in W m^{-2}. The annual average at each latitude has been removed. The atmospheric solar absorption is calculated from the CERES data at the TOA and surface and the surface heating is calculated from the residual of the terms in the atmospheric energy budget. The left panels are the calculations presented in the original manuscript and the right panels are the same fields calculated from Trenberth and Stepaniak's (2003) heat flux convergence and total column tendency data in conjunction with the CERES radiative fluxes.

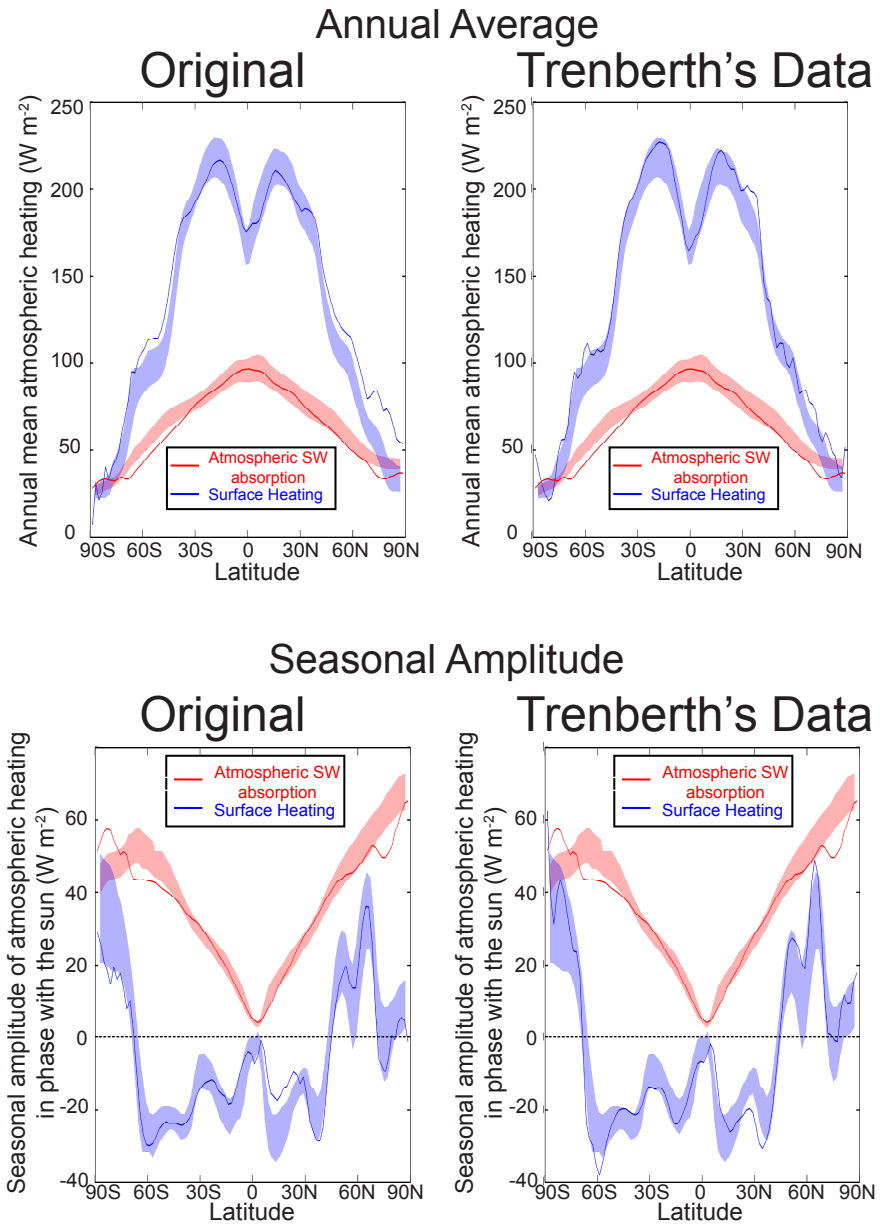

Figure 2: Zonal mean heating of the atmosphere in the annual average (Top Panels) and in the seasonal cycle (Bottom Panels). The heating is divided into atmospheric shortwave absorption (SWABS, red) and upward surface fluxes (blue). The seasonal amplitude is defined throughout as the amplitude of the Fourier harmonic in phase with the sun. In each figure, the solid line is the observations and the shading is 1σ about the ensemble mean pre-industrial simulations from the CMIP3 models. The left panels are the calculations presented in the original manuscript and the right panels are the same fields calculated from Trenberth and Stepaniak's (2003) heat flux convergence and total column tendency data in conjunction with the CERES radiative fluxes.

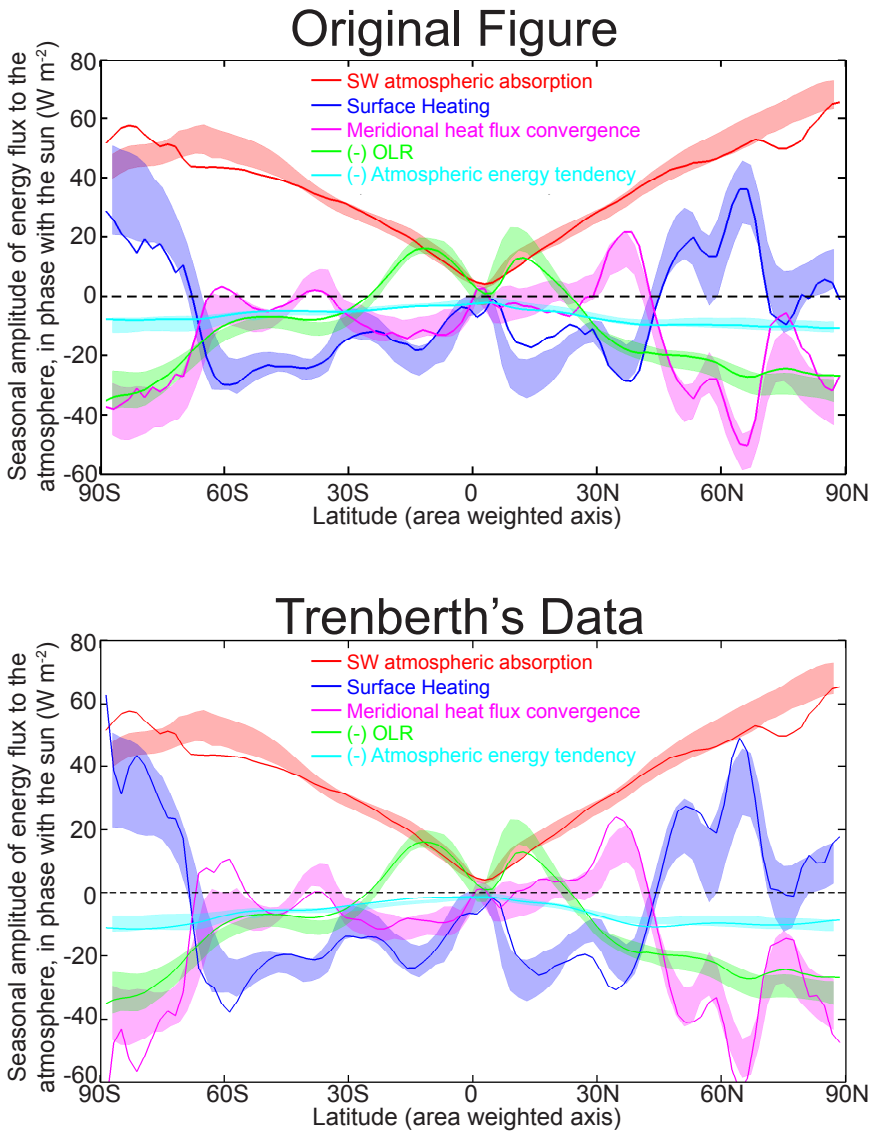

Figure 3: The seasonal amplitude of atmospheric energy fluxes in phase with the sun (positive fluxes amplify the seasonal cycle, negative fluxes reduce the seasonal cycle). Solid lines are observations and shaded regions represent $\pm 1\sigma$ about the ensemble mean pre-industrial simulations from the CMIP3 models. The top panel shows the calculations presented in the original manuscript and the bottom panel shows the same fields calculated from Trenberth and Stepaniak's (2003) heat flux convergence and total column tendency data in conjunction with the CERES radiative fluxes.

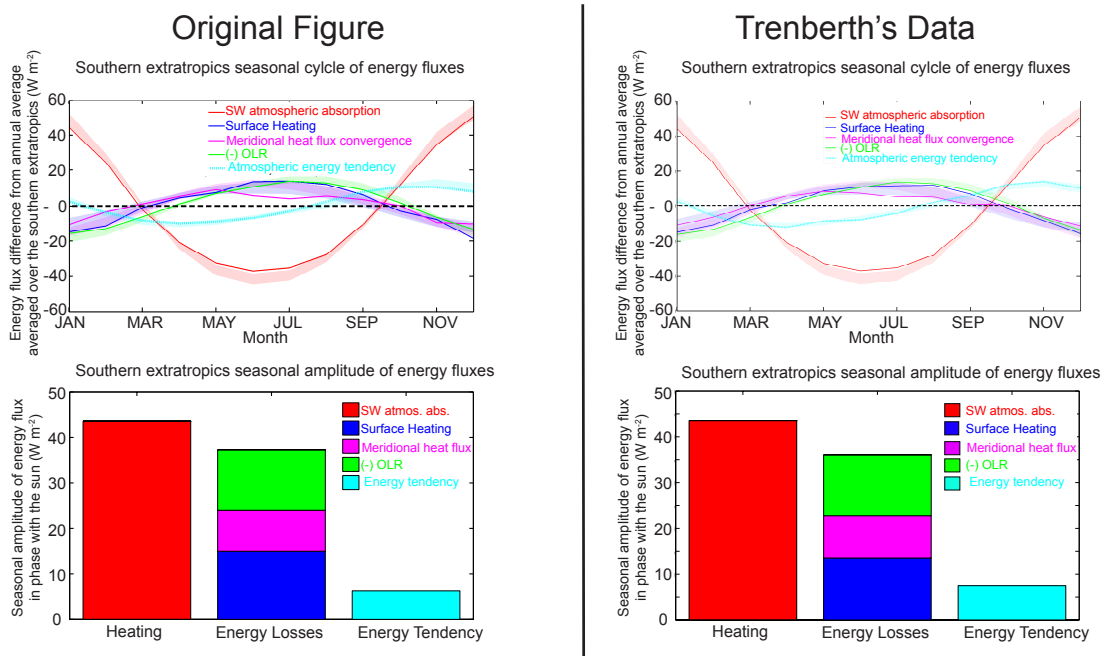

Figure 4: (top panels) The seasonal cycle of atmospheric energy fluxes(in W m^{-2}) averaged over the southern extratropics – defined as poleward of 42°S. The observations are shown by the solid lines and the shaded region represents $\pm 1\sigma$ about the CMIP3 PI ensemble average. The annual average of each term has been removed. (bottom panels) The seasonal amplitude of the atmospheric energy fluxes in phase with the seasonal cycle of solar insolation averaged over the extratropics. The terms that amplify the seasonal cycle in temperature (heating) are in the first column. The seasonal energy loss terms (cooling) are in the second column. The third column is the energy stored in the atmospheric column (energy tendency). The individual terms are color coded in the legend in the upper left panel and explained in the text. The left panels are the calculations presented in the original manuscript and the right panels are the same fields calculated from Trenberth and Stepaniak's (2003) heat flux convergence and total column tendency data in conjunction with the CERES radiative fluxes.

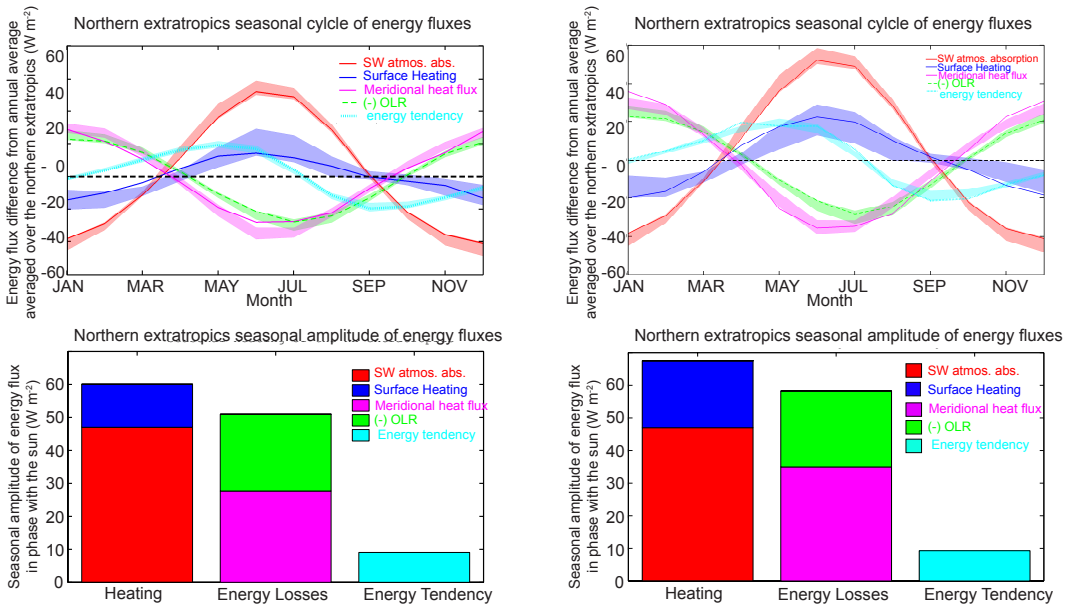

Figure 5: As in Figure 4 except averaged over the Northen extratropics – defined as poleward of 42°N.

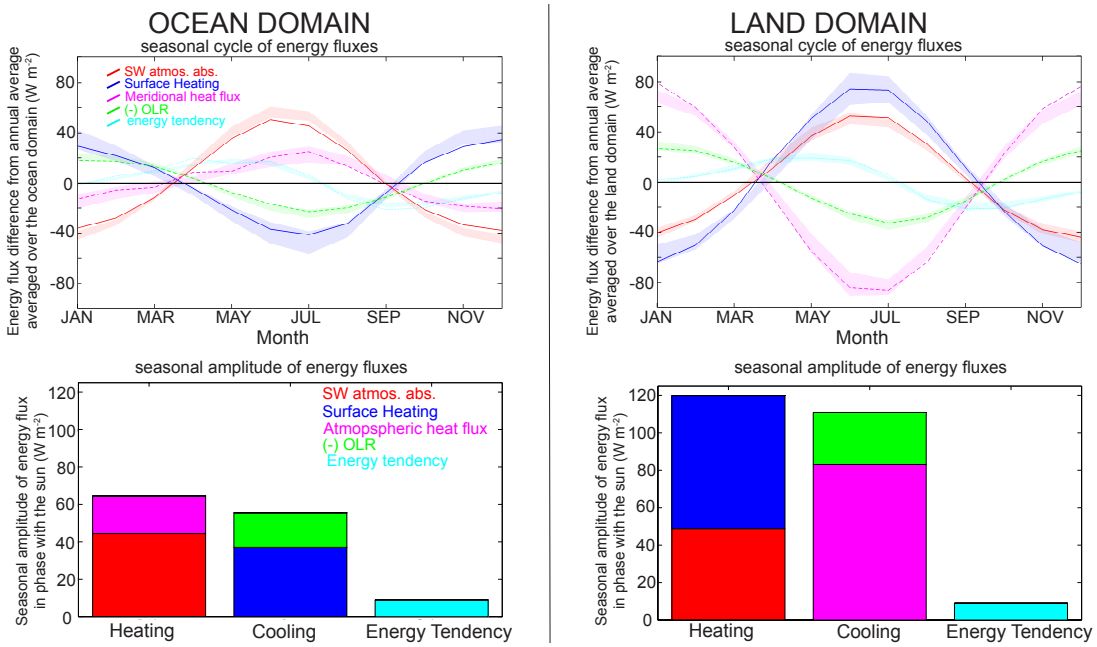

Figure 6: All fields shown are calculated from Trenberth and Stepaniak's (2003) heat flux convergence and total column tendency data in conjunction with the CERES radiative fluxes. (Top panels) The seasonal cycle of energy fluxes averaged over the atmosphere in the NH extratropical ocean domain (left panel) and land domain (right panel). Observations are given by solid lines and the shading represents 1σ of the CMIP3 pre-industrial ensemble. (Bottom panels) The seasonal amplitude of energy fluxes (in phase with the sun) averaged over the ocean/land domains. The amplifying fluxes are on the left and the damping (i.e, out of phase fluxes) are in the middle (colors are described in the legend).

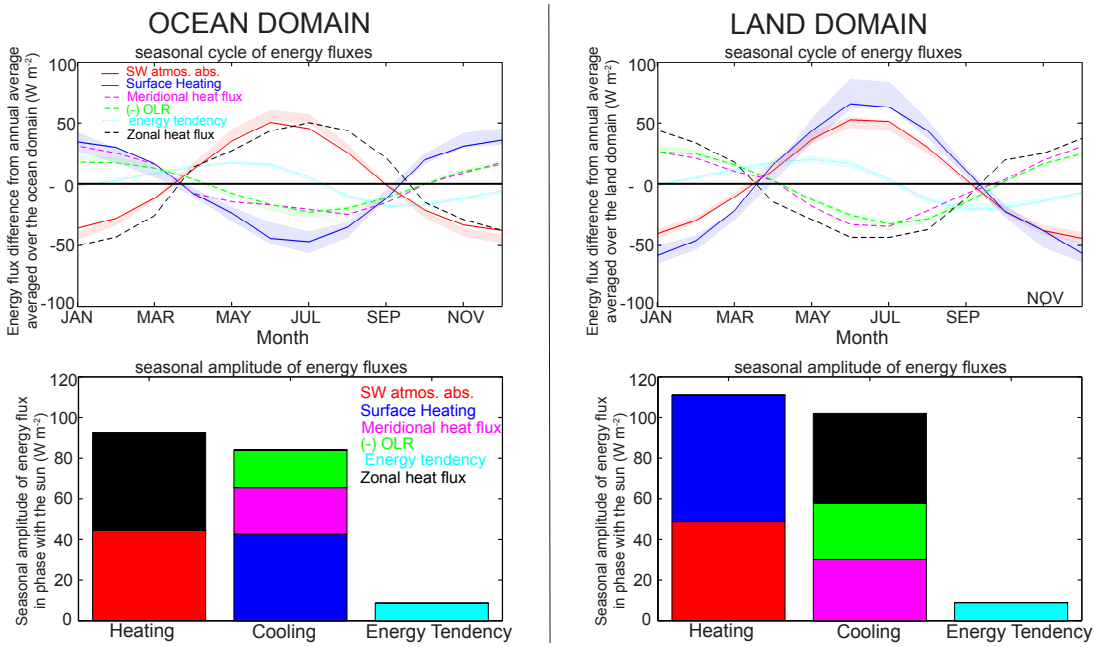

Figure 7: Figure 7 of the original manuscript is repeated here for ease of comparison with Figure 6 in this response.(top panels) The seasonal cycle of energy fluxes averaged over the atmosphere in the NH extratropical ocean domain (left panel) and land domain (right panel). Observations are given by solid lines and the shading represents 1 of the CMIP3 pre-industrial ensemble. The atmospheric heat fluxes are decomposed into zonal and meridional components in the observations. (bottom panels) The seasonal amplitude of energy fluxes (in phase with the sun) averaged over the ocean/land domains. The amplifying fluxes are on the left and the damping (i.e, out of phase fluxes) are in the middle (colors are described in the legend).

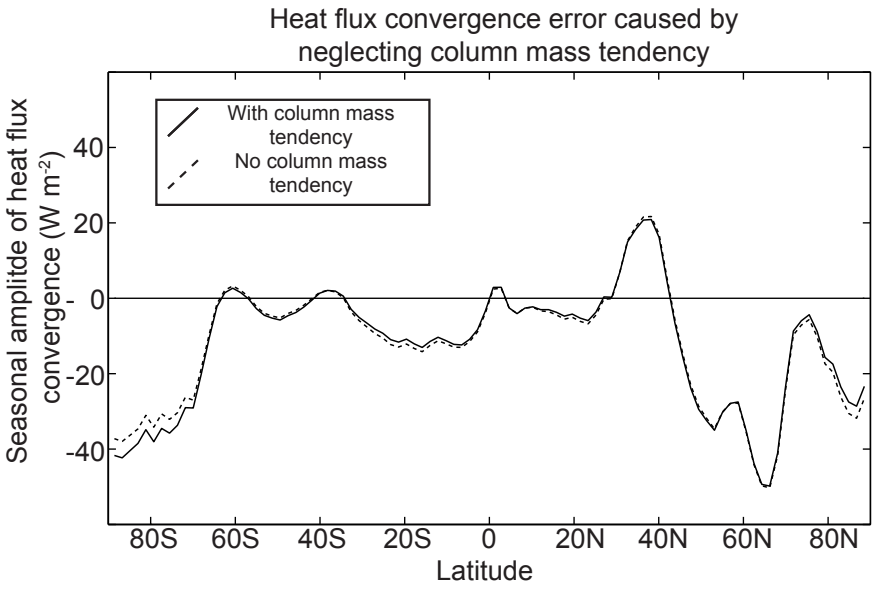

Figure 8: Effect of neglecting the mass column tendency on the energy flux calculations presented in this manuscript. The solid line is the seasonal amplitude of the zonal average energy flux convergence using all terms and the dashed line is the same calculation neglecting the column mass tendency term (first term in Equation A5).

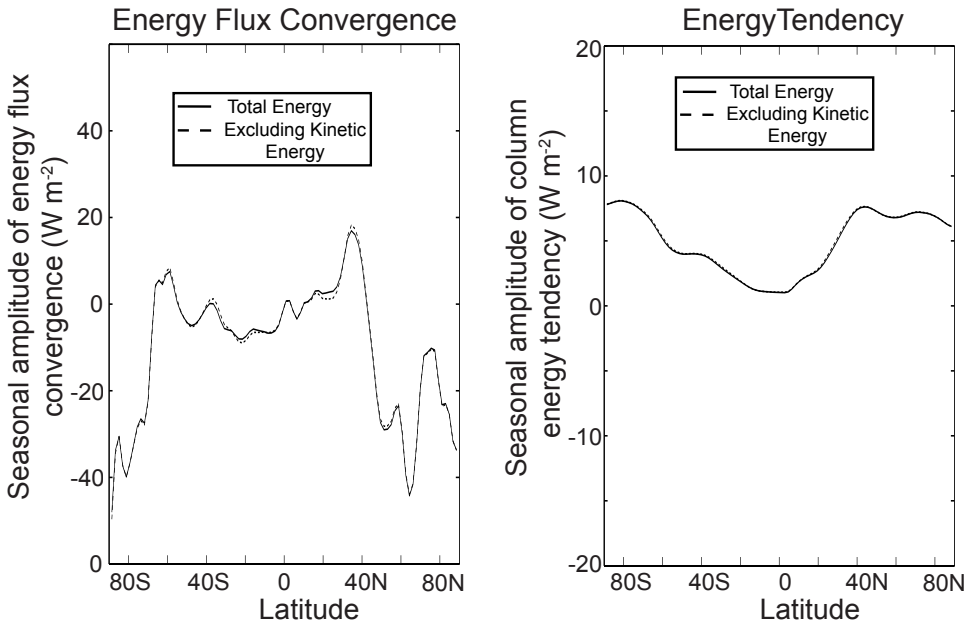

Figure 9: The seasonal amplitude (the amplitude of the annual Fourier harmonic in phase with the insolation) of the horizontal energy flux convergence (left panel) and the energy tendency. The solid line is the total energy and the dashed line is the total energy minus the kinetic energy. All calculations were done from Fasullo and Trenberth's (2008b) data.

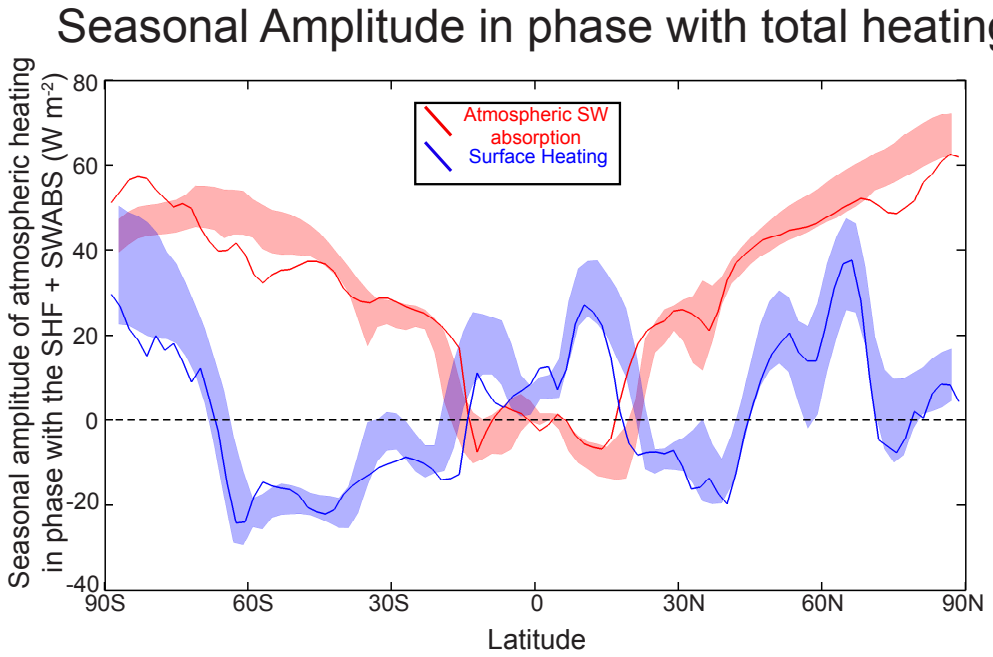

Figure 10: The seasonal amplitude of $SWABS$ (red) and SHF (blue) in phase with the total heating ($SWABS$ + SHF) at each latitude. The solid lines are the observations and the shading is $\pm 1\sigma$ about the CMIP3 inter-model mean.