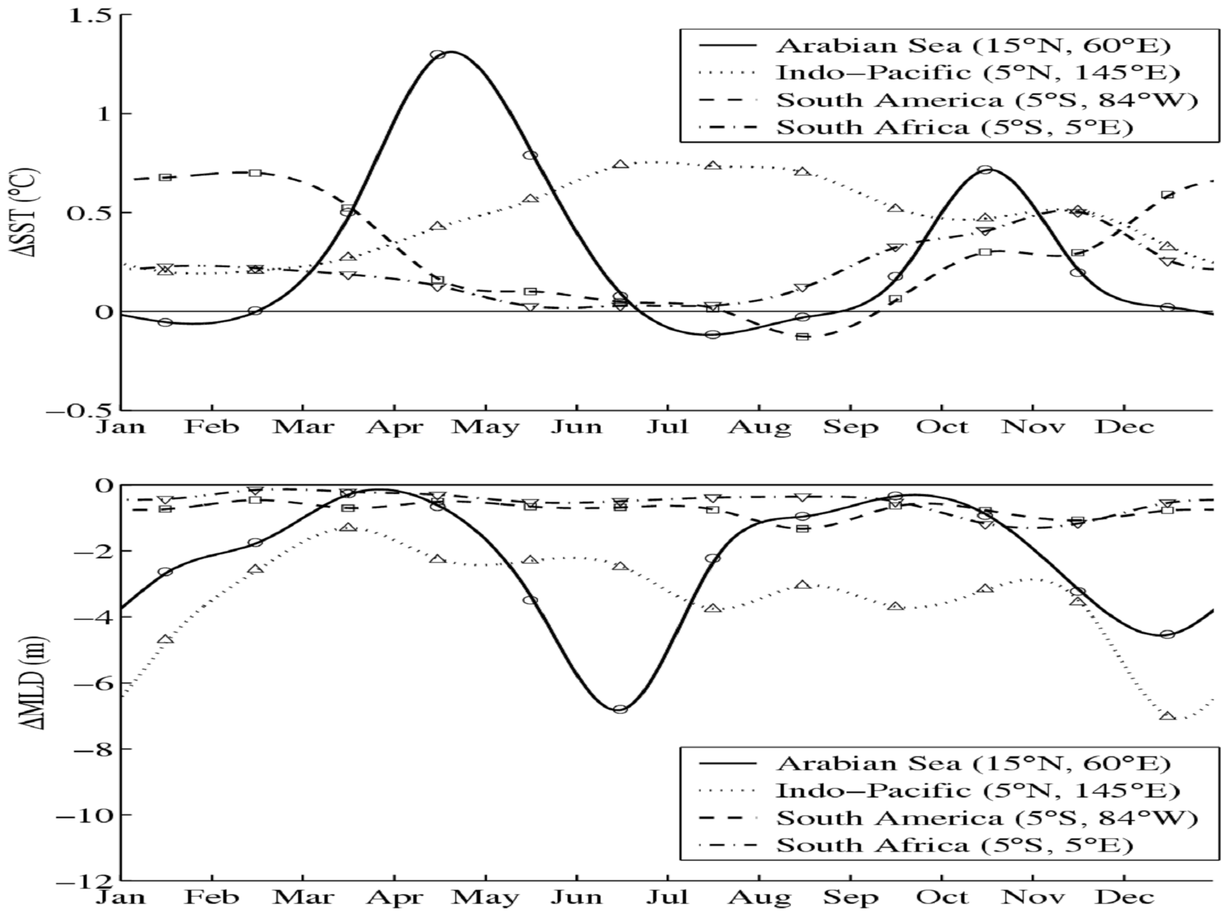

Figure 3. Seasonal differences in OGCM SST and MLD when neglecting and including subsurface heating. Shown are the results when all the PAR is absorbed within the mixed layer minus the SST when the PAR is attenuated using monthly k_{PAR}.

Is examined in terms of the model's prediction of sea surface temperature (SST) and surface mixed layer depth (MLD). The subsurface heating due to PAR is included in the OGCM by considering the surface heat flux absorbed within the mixed layer to be given by

$$Q_{abs}(z) = Q_{Net} - \mathrm{PAR}\ exp(-k_{PAR}\, h_m)\ ,$$

where Q_{Net} is the net surface heat flux, PAR is taken as a fraction of the surface solar irradiance ($0.49\ Q_{sol}$), and h_m is the MLD. The mean monthly fields from the Comprehensive Ocean-Atmosphere Data Set (COADS) (da Silva et al., 1994) are used for heat flux forcing.

To determine the consequences of subsurface heating on SST and MLD we performed 2 NLOM simulations:

1) Set k_{PAR} to a large value so the PAR is completely absorbed within the mixed layer.

2) Used the monthly k_{PAR} fields to account for the seasonal & spatial variation.

The differences between these simulations (Figure 3) reveal that changes in seasonal variability can be as large as 1-1.5°C for SST while they are only 1-6 m for MLD. These

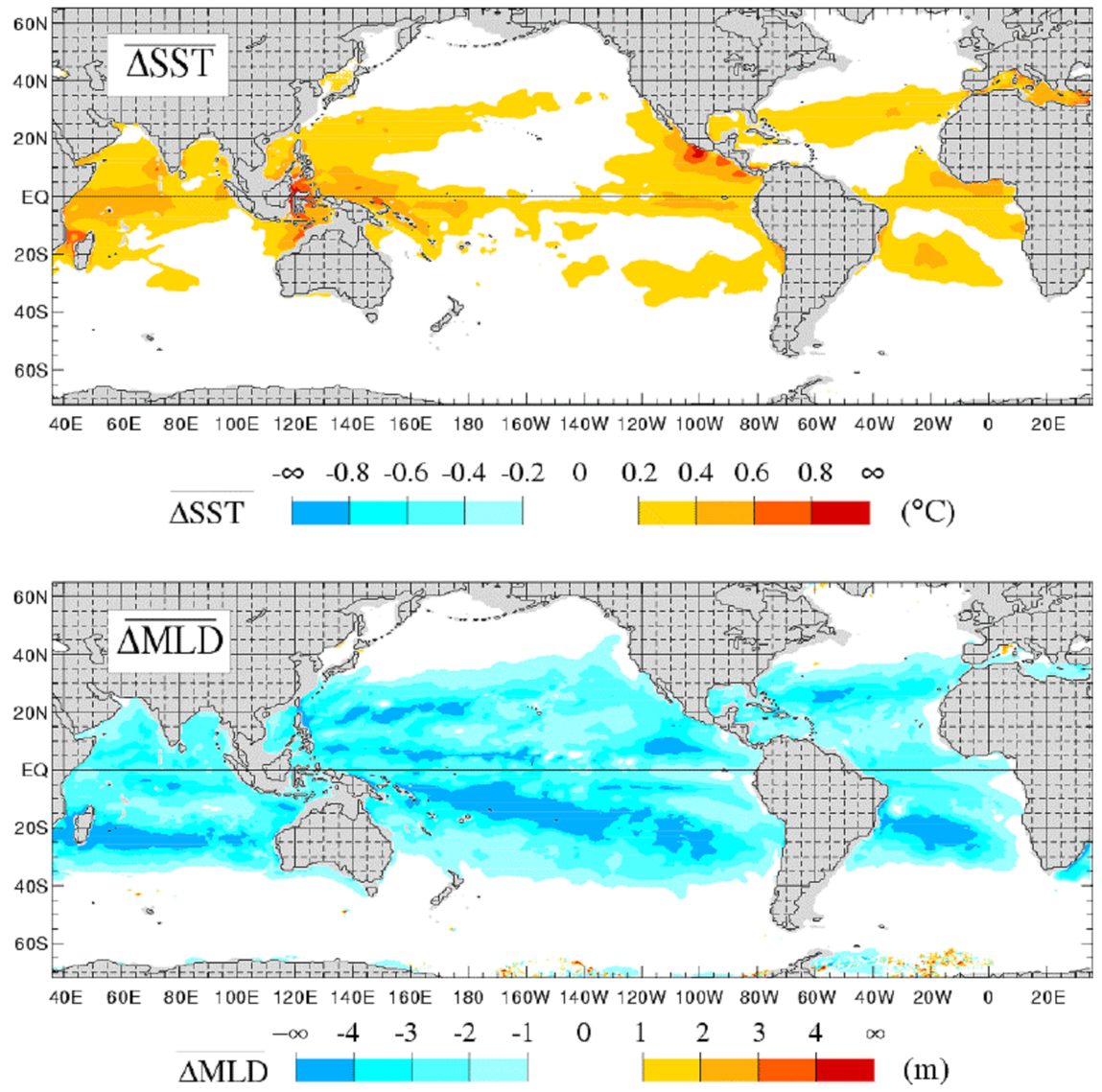

Figure 4. Annual mean differences in global OGCM SST and MLD as in Figure 3.

changes in SST and MLD are mostly confined to the low and mid latitudes (40°S-40°N).

Summary

We find that subsurface heating yields a marked increase in the SST predictive skill of the OGCM at low latitudes. Use of the monthly-mean k_{PAR} reduces the annual mean SST by up to 0.8°C, and negligibly increases MLD on climatological time scales.

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