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Temperature, albedo and evapotranspiration differences between forested and non-forested areas from MODIS observations

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Land cover influences fluxes of mass and energy between the surface and the atmosphere, impacting climate on a broad range of spatial and temporal scales. To enhance our understanding of the climate system, it is important to understand how these fluxes change as a function of surface cover. This knowledge is particularly important in determining the climatic response to land cover change. Here we use remotely sensed global data from MODIS at 0.05˚ x 0.05˚ spatial resolution to evaluate the local difference in temperature, albedo and evapotranspiration (ET) between forested and non-forested areas. The MODIS land cover product is used to determine the location of forested areas during the period between 2003 and 2007. In agreement with a large body of previous research, the albedo of non-forested areas is larger than that of forested areas, with the difference tending to increase with latitude. Also as expected, the ET over non-forested areas is smaller, with maximum differences found at lower latitudes. The pattern of temperature differences is more complex and not set exclusively by latitude. While non-forested areas are predominantly warmer at latitudes between +-30˚, at mid and high latitudes temperature differences are mixed, with some non-forested areas being warmer while others are cooler than forested areas. This observed heterogeneity in the temperature differences is not presently well captured by global and regional climate models.