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Analyzing the Local Climate Impacts due to the Three Gorges Dam

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The Three Gorges Dam (TGD) on the Yangtze River in China will create the world's largest man-made reservoir by 2009, when it is expected to fill the 39.3 billion m³ storage capacity. The submerged 663 km length of the Yangtze River will result in a 1040 km² wet surface area, representing a land use change in topography and evaporation that will change the local climate. The local climatic impacts due to this surface area change have not been systematically quantified and are not fully understood. In this climate sensitivity study, the change in surface characteristics in the TGD area from one of steep vegetated terrain to a large flat water surface were simulated and analyzed for the six month period 1 April to 30 September 1990 using the non-hydrostatic version of the Penn State/National Center for Atmospheric Research (NCAR) Mesoscale Model Version 5 (MM5) with the Community Land Model version 2 (CLM2). Initial results indicate a decrease in temperature. An analysis suggests that increased surface evaporation leads to a colder surface, which further cools the atmospheric column, producing stronger downdrafts of air mass, and dissipating the clouds. The reduction in clouds, in turn causes an increase in solar radiation, countering the decrease in surface temperature. However, at the same time, the stronger descending air mass appears to diverge atmospheric moisture out of the region in the lower troposphere, which tends to reduce the exaggerated precipitation caused by the intensified surface evaporation. An evaluation these physical processes are presented and along with discussion on future climate trends in the TGD region. .