



Impact of the desiccation of the Aral Sea on local and regional climate

Somnath Baidya Roy (1), Maxwell Smith (1), Lucinda Morris (1), Sergei Volis (2), Nikolay Orlovsky (3), and Abdulkhodi Khalilov (4)

(1) University of Illinois at Urbana-Champaign, Atmospheric Sciences, Urbana, IL, USA, (2) Key Laboratory of Biodiversity and Biogeography, Kunming Institute of Botany, Chinese Academy of Sciences, Kunming, China, (3) Jacob Blaustein Institutes for Desert Research, Ben-Gurion University of the Negev, Sede Boqer Campus, Israel, (4) Scientific Center of Plant Production, Uzbekistan Academy of Sciences, Tashkent, Uzbekistan

The Aral Sea located in Central Asia has undergone drastic changes in the last 30 years. Once the world's fourth largest freshwater lake, it has lost most of its water due to human consumption, primarily for meeting agricultural needs. This study attempts to (i) quantitatively estimate the change in lake surface area and (ii) investigate how this change can affect local and regional temperatures. First the lake surface area is estimated from LANDSAT satellite imagery using edge-detection software. This analysis shows almost a 90% reduction in lake area during the 1980-2012 period. Next, a new land cover map is developed to represent the changes observed from LANDSAT data and implemented in the Weather Research and Forecasting (WRF) regional climate model. Simulations with the WRF model show that change in the lake surface area can lead to a statistically significant warming of more than 5C in near-surface air temperatures over the dry lake bed during the summer months. The simulations also show a significant warming signal of more than 1C over a region 100 km away from the lake boundary. Increase in surface sensible heat flux and reduction in surface latent heat flux is likely responsible for the simulated warming. Similar warming signals are seen in observed near-surface air temperatures from the Global Historical Climatology Network dataset. This consistency between simulated and observed data strongly suggests that the desiccation of the Aral Sea has significantly altered local and regional climate.