



Irrigation induced climate change in Southeastern Turkey

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Southeastern Anatolia is a large, semi-arid region of Turkey. Southeastern Anatolian Project (commonly known with Turkish initials GAP) aims to develop the region both socially and economically by using the water potential in the area for irrigation purposes. With the water provided by the GAP, people of the region started to use this large barren region for agriculture by cultivating primarily cotton and corn. These agrarian activities consequently changed the physical characteristics of the surface. These changes are expected to show their effects on climate. To investigate the differences in regional climate before and after GAP, two hydrometeorological observation systems have been installed at two sites reflecting pre- and after GAP surface cover. Each system includes an automatic weather station to measure temperature, humidity, wind speed and direction, net radiation, insolation and precipitation, and an Eddy-Covariance system to measure sensible and latent heat fluxes, water vapor and carbondioxide concentrations and carbon fluxes. One of the systems was installed to a place where there was no cultivation, irrigated or not. The other system was then installed at a site where there was irrigated cotton cultivation.

One year long observations showed that the GAP irrigation increased humidity and decreased temperature mostly in summer months, when cotton cultivation is done. The cotton field, most likely, reduces the albedo of the surface and thus allowing more energy to be absorbed at the surface. This leads to an increase in net radiation for the irrigated cotton field, which is also confirmed by the observations. Compared to the dry area reflecting the pre-GAP conditions, the irrigated crop field use more energy for transpiration and evaporation purposes, which means more partition of this

energy to the latent heat flux. Evapotranspiration, while making the surface air more humid, causes cooling at the surface (evaporative cooling). In the dry area, on the other hand, more energy is partitioned to the sensible heat flux because there is little or no water to evaporate. These are point measurements, but they can be indications of a change in the climate of the region as a result of the GAP irrigation. This topic is also studied further using regional climate models by generating climate change scenarios for Southeastern Anatolia.