Geophysical Research Abstracts
Vol. 18, EGU2016-1888, 2016
EGU General Assembly 2016

Remote climate drivers as predictors of precipitation in data sparse regions, an example from Central Asia

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It is widely understood that hydrologic variables, such as precipitation and stream flow can be significantly influenced by large scale atmospheric circulation patterns. Global scale analysis of teleconnection patterns between remote large scale climate drivers (e.g. ENSO) and hydrologic variables has highlighted the potential for forecasting precipitation anomalies (Dai and Wigley, 2000). Detailed analysis at smaller spatial scales is required to determine the strength of relationships at the catchment scale. These relationships have significant potential for regions with sparse ground based monitoring networks, such as Central Asia. However, sparse observations hinder the determination of relationships between remote climate drivers and patterns of precipitation. The area based nature of remotely sensed precipitation estimates can combat this problem allowing precipitation patterns to be understood at relatively high spatial and temporal scales.

Using Tropical Rainfall Measuring Mission (TRMM) precipitation estimates, correlation patterns are determined between several remote climate drivers (ENSO, NAO and South Asian Monsoon) and Central Asian precipitation. Preliminary analysis has shown statistically significant negative correlations between Southern Oscillation Index (SOI) and winter precipitation over the headwaters of the Amu Darya (Pamir Mountains, Tajikistan). Introducing a lag interval of up to six months increases correlations across Tajikistan, as well as introducing statistically significant correlations over the headwaters of the Syr Darya (Tien Shan Mountains, Kyrgyzstan). These findings open promising avenues for exploration, including the potential to use remote climate drivers as predictors for seasonal flow forecasting.