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# DEVELOPMENT OF A NEW SOIL MOISTURE INDEX USING SMOS SATELLITE SOIL MOISTURE PRODUCTS: CASE STUDY IN SOUTHWESTERN MONGOLIA

# ENTWICKLUNG EINES NEUEN BODENFEUCHTEINDEX UNTER VERWENDUNG VON SMOS-SATELLITEN-BODENFEUCHTIGKEIT PRODUKTEN: FALLSTUDIE IN DER SÜDWESTLICHEN MONGOLEI

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## SUMMARY

The shortage of precipitation in Mongolian regions exacerbates droughts. Consequently, it reduces vegetation productivity and aggravates moisture stress on pastureland. Because national meteorological network is scarce, a new generation of soil moisture data with a high spatial resolution can be alter-native for various applications such as drought monitoring, wild or anthropogenic forest fires, agricultural management, and water management. Modern remote sensing products provide us with an opportunity to overcome such a scarcity of in situ local measurement networks. In particular, we suggest a new index named "Gobi soil moisture index (GI)", which uses soil moisture as a proxy for monitoring of drought occurrence for semi-desert areas and with an intensity at ~ 1 km spatial resolution. This index integrates several different remote sensing products with in situ observations, based on multiple linear regression method for soil moisture and ocean salinity (SMOS) mission product, three moderate resolution imaging spectroradiometer (MODIS) satellite products, i.e., land surface temperature (LST), the normalized difference vegetation index (NDVI) and potential evapotranspiration (PET), and in situ soil moisture (SM) and precipitation observations. With soil moisture, evapotranspiration, and land surface temperature, the GI index indicates the response and vulnerability of arid and semi-arid vegetation to drought severity-associated changes in evapotranspiration. The new established soil moisture index GI was used to monitor grassland drought and vegetation response to varying soil/climatic conditions, with an application in southwest Mongolia from 2000 to 2018 and its two summer months (July, August).

The results show that the correlation was statistically significant between GI (model) and SMOS SM data, and in-situ SM observations from the regional meteorological stations at 10-15 cm depths ($p < 0.0001$). We also retrieved a subset of Soil Moisture Active/Passive