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# Revisiting the 1930s "Dust Bowl"

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The Midwest of the USA is a region repeatedly affected by droughts, the most famous being the "Dust Bowl" drought of the 1930s, which had devastating social and economical consequences. This drought as well as other past drought events in the Midwest have been linked to SST anomalies in both the (tropical) Pacific and Atlantic and resulting fluctuations in upper-level circulation in the Pacific/North American sector.

The effect of large-scale SST anomalies on droughts in the Midwest most likely proceeds through two processes: (a) changes in the intensity of the Great Plains Low Level Jet (GPLLJ), which advects moist air from the Gulf of Mexico to the interior of the North American continent, and (b) persistent blocking and subsidence governed by the mid- and upper-level geopotential height (GPH) field.

Under normal conditions the GPLLJ is responsible for a substantial fraction of the total moisture transport into and precipitation in the Midwest. Interannual changes are caused by a displacement or strengthening/weakening of the climatological pressure centres, which has been linked to the SST distribution as well as to the Asian Monsoon. The droughts may additionally be intensified/prolonged by land-atmosphere interactions.

Here we analyse historical pilot balloon data from the Great Plains region for the 1930s as well as hemispheric upper-level reconstructions. We show that the GPLLJ was significantly weakened during the 1930s, and that large-scale subsidence suppressed convection. Both was related to a strong and persistent high pressure anomaly, which is found throughout the vertical extent of the troposphere. Anomalies in the upper-level

flow pattern are consistent with climate model simulations forced with observed sea-surface temperatures. This knowledge is important for assessing potential predictability of future droughts.