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**LARGE-SCALE DYNAMICS AND REGIONAL PROCESSES AFFECTING**

**DROUGHTS IN CENTRAL ARGENTINA**

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Southeastern South America is among the most fertile regions in the world, with a large diversity of crops, including wheat, corn, sugar cane and soybean. Agricultural production has significantly increased in the last two decades, in part due to technological advances but also because of more beneficial climate conditions. However, the region is subject to high climate variability, implying the frequent production of floods and droughts. Previous studies have linked the region’s precipitation anomalies to the Pacific sea surface temperature anomalies (El Nino-Southern Oscillation, ENSO mode) that force changes in the large scale circulation through changes in the Walker circulation, the regional Hadley cells and location and intensity of the storm tracks. A cold Pacific is known to induce dryness over southern South America. It is shown here that the Pacific forcing is a necessary but not sufficient condition for droughts. The drought region over southern South America becomes stronger, and its shape better defined, when the cold Pacific is complemented with a warm North Tropical Atlantic (NTA mode) involving two mechanisms: (a) by enhancing the regional Hadley cell circulation with a stronger ascending branch around 0-20° N and increased descending motions approximately between 5-40 degrees south (collocated with the increased dryness); and (b) by influencing the moisture transports over large areas.

While the remote forcings act as the main driver of extremes, land-atmosphere feedbacks can contribute to the lifecycle of droughts. Regional model simulations of a severe drought event that took place during 2008 reveal that vegetation changes due to the drier conditions modify the spatial distribution of properties like green vegetation fraction, albedo, surface roughness length, stomatal resistance and the deeper ground conditions like root depth and soil moisture. In all, their realistic representation in models leads to reduction in model biases and thus better representation of drought. It is suggested that a key aspect of drought awareness is the need to monitor diverse variables that not only represent climate conditions, like a deficit of water or soil moisture, but that also can describe the vegetation health and other properties of the land cover.

Due to the increased vulnerability of the region to climate extremes, the climate research community is facing complex challenges that require identifying research themes critical for improving our understanding of sources and intrinsic levels of predictability on intraseasonal, interannual, decadal and longer time scales. Likewise efforts need to be placed in improving the overall understanding and prediction of climate extreme events and their impacts on key environmental services and on society. Lastly, strategies need to be defined to narrow the gap between current predictive capabilities in the region and estimated limits of predictability. To this end, during next year a Planning Conference will be held with the support of the World Climate Research Programme (WCRP) contributing to the development of Climate Services in the region to (a) improve our knowledge on the climate system, the interactions among its components and the limits of predictability, and (b) to enhance our ability to interact with other disciplines, particularly decision makers and social scientists in order to translate basic climate knowledge into actionable science.