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Long-term variability and trends in the Caspian Sea – Hindu Kush Index: Influence on atmospheric circulation patterns, temperature and rainfall over the Middle East and southwest Asia

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Abstract

The Caspian Sea – Hindu Kush Index (CasHKI) has been introduced as an indicator of modulation of the wind regime and dust activity over southwest (SW) Asia. This study analyzes the long-term series in CasHKI values and the associated mean sea-level pressure (MSLP) anomalies over the Caspian Sea (CS) and Hindu Kush (HK) domains during the period 1963 – 2014, aiming at examining the trends in CasHKI and the associated climate implications. An overall negative trend (-0.12 hPa per decade) in CasHKI is revealed during 1963 – 2014, **mostly driven by** the large decrease in CasHKI during 1963 – 1980, whereas an increasing trend is found during the 2000s. The CasHKI values are mostly related to the MSLP anomalies over the CS rather than HK domain; however, the negative anomalies in MSLP over HK during the 1960s determine the corresponding CasHKI trends. The MSLP values and anomalies show a regional shift in the **core** maximum and higher increasing trends at the southern compared to northern latitudes within the CS domain. The synoptic maps of the MSLP, geopotential height at 700 hPa (Z700) and vertical profile of the meridional wind are compared between the months with highest and lowest CasHKI values, **revealing a** significant intensification in the **north** wind over the SW Asia and **a** deepening of the Indian/Pakistan thermal low for the high-CasHKI months in summer. In addition, the high-CasHKI months are mostly associated with a decrease in Z700 over SW Asia and the Middle East, an intensification of the Indian monsoon trough, a decrease in temperature over the SW Asia and a **slight** increase in rainfall over parts of SW Asia, Middle East and east Africa. Finally, ENSO variability seems not to be significantly linked with CasHKI - but this issue requires further examination.

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