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Climatology of the Heat Low and the Intertropical Discontinuity in the Arabian Peninsula

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The climatological state and the seasonal variability of the Arabian Heat Low (AHL) and the Intertropical Discontinuity (ITD) are investigated over the Arabian Peninsula using the 1979-2019 ERA-5 reanalysis data. The AHL is a summertime feature, mostly at 15°-35°N and 40°-60°E, exhibiting a clear strengthening over the last four decades in line with the observed increase in surface temperature. However, no clear shift in its position is detected. The AHL has a center over the Arabian Gulf and eastern Arabian Peninsula, co-located with the highest surface temperatures, and another over central Saudi Arabia, driven by low-level wind convergence and subsequent increase in atmospheric thickness. The ITD is the boundary between the hot and dry desert air and the cooler and more moist air from the Arabian Sea. It lies along the Arabian Peninsula's southern coastline in the cold season but reaches up to 28° N between 50° - 60° E in the summer months. While the former has a rather small diurnal variability, the latter shows daily fluctuations of up to 10°. The ITD exhibited a weak northward migration in the 41-year ERA-5 period, likely driven by the increased sea surface temperatures in the Arabian Sea. On interannual timescales, the El Niño-Southern Oscillation, the Indian Ocean Dipole, and solar-geomagnetic effects play an important role in the AHL's and ITD's variability.