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Extension of downwelling mid-infrared radiances to the far-infrared using REFIR-PAD instrument over clear-sky in Antarctica

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Radiative far-infrared exchanges play a key role in determining the surface energy budget under dry atmospheric conditions such as those typically found in polar regions. But because of the paucity of measurements across this spectral range, climate models suffer from a lack of constraint. Exploiting a method built to extend upwelling far-infrared radiances from mid-infrared observations, we evaluate the potential for estimating downwelling far-infrared radiances for clear-sky cases over Antarctica. Observational data obtained by the instrument REFIR-PAD in Antarctica are used to assess the method, along with LBLRTM spectral simulations based on radio-sonde measurements. We discuss the impact of noise on the correlation between the mid-infrared and far-infrared, and show how simulations using the radiosonde profiles alone are unable to capture the observed relationship between the far and mid-infrared.