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VELOX - A new thermal infrared imager for airborne remote sensing of cloud and surface properties

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The new airborne thermal infrared imager VELOX (Video airborne Longwave Observations within six channels) is introduced. It covers six spectral bands in the thermal infrared wavelength range from 7.7 μm to 12 μm and is operated on board of the German High Altitude and Long Range Research Aircraft (HALO) of the German Aerospace Center (Deutsches Luft und Raumfahrtzentrum, DLR). The imager measures two-dimensional (2D) fields of the upward terrestrial radiance within a field of view of 35.5° by 28.7° with 640 by 512 spatial pixels. These 2D radiance fields can be converted into 2D fields of brightness temperature. With a horizontal resolution of better than 10 m VELOX extends the HALO remote sensing instrument suite to observe clouds and surface properties. The calibration and correction procedures for VELOX are presented. First measurements, collected during the EUcidating the RoIE of Cloud-Circulation Coupling in ClimAte (EUREC⁴A) campaign are shown, including analysis of the cloud top brightness temperature, cloud mask/fraction calculations, cloud top altitude estimates, and Sea Surface Temperature (SST) analysis. The investigations reveal that the cloud top temperature can be resolved with a resolution of about 0.1 K, which translates into a vertical resolution of about 10 m with respect to cloud top altitude.