Ground-based Thermal Imaging for Clouds

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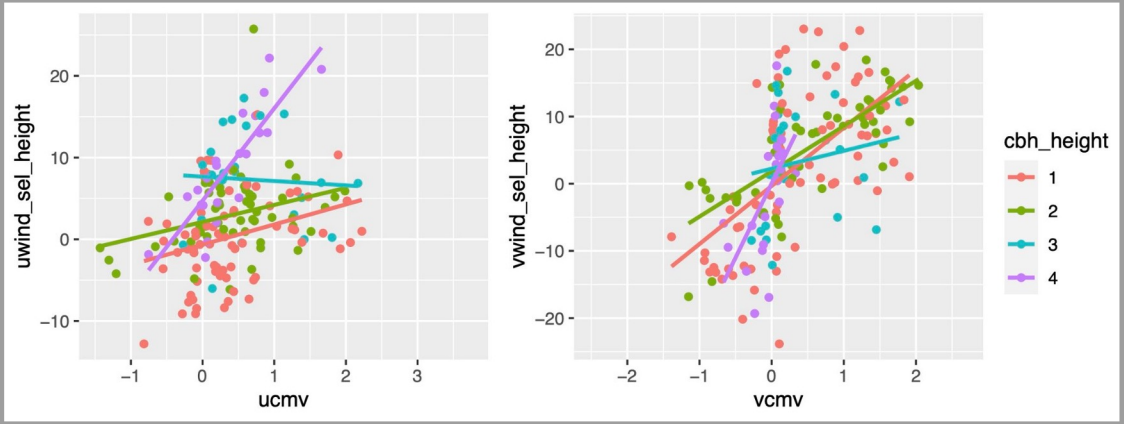
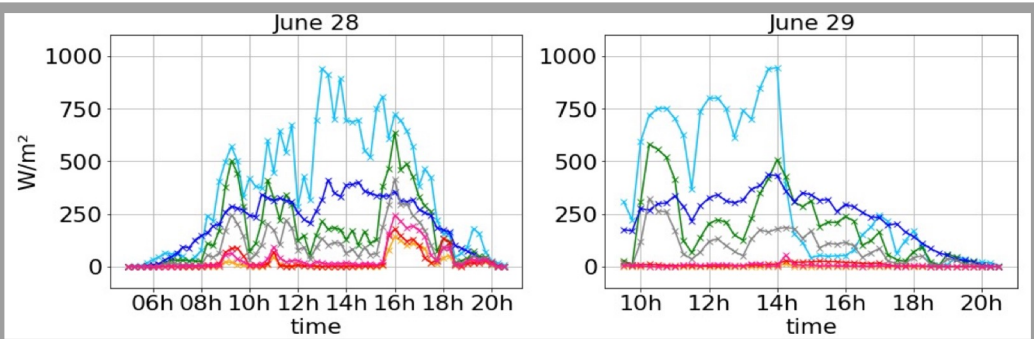
Cloud Base Height and Transparency

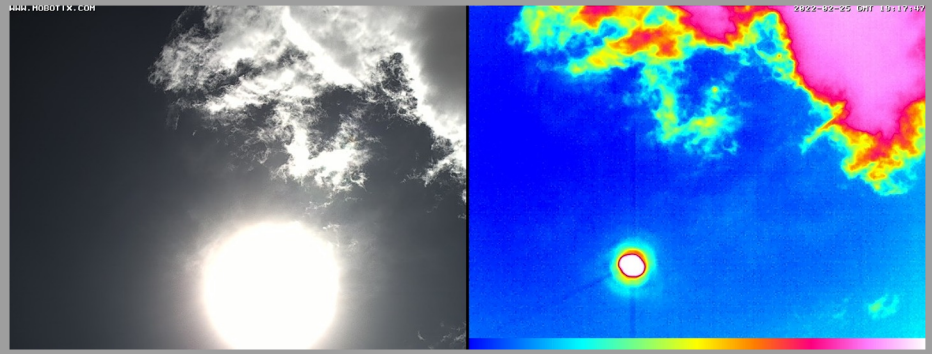




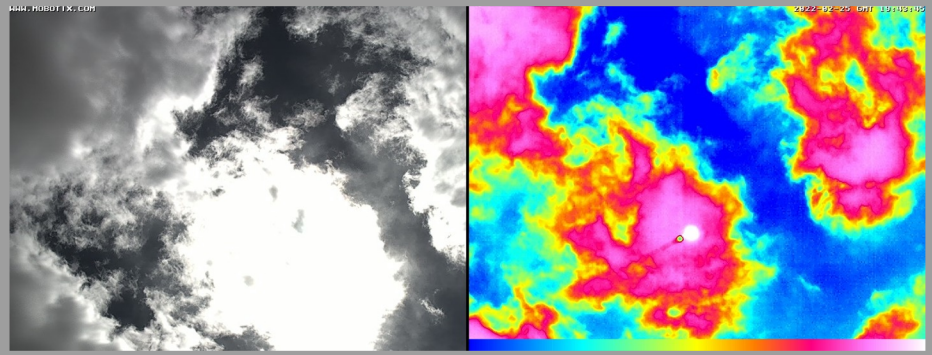
- Knowing cloud-base height adds value to the derived Cloud motion.

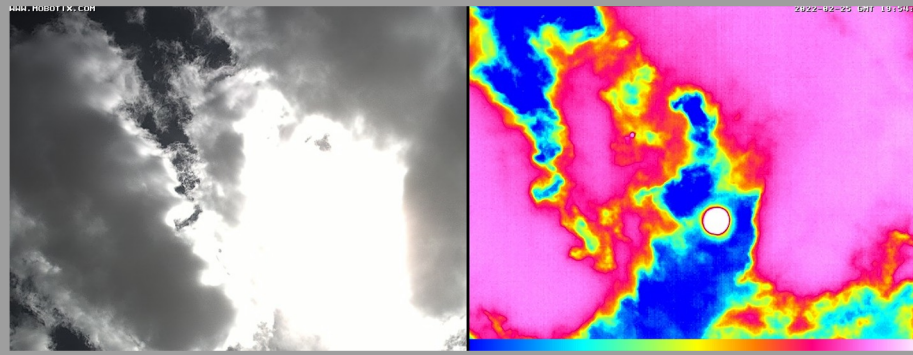
- Semi-transparent clouds and Sun reflections in optical images cause errors in cloud cover and solar irradiance estimation.

Optical and thermal IR camera sky images

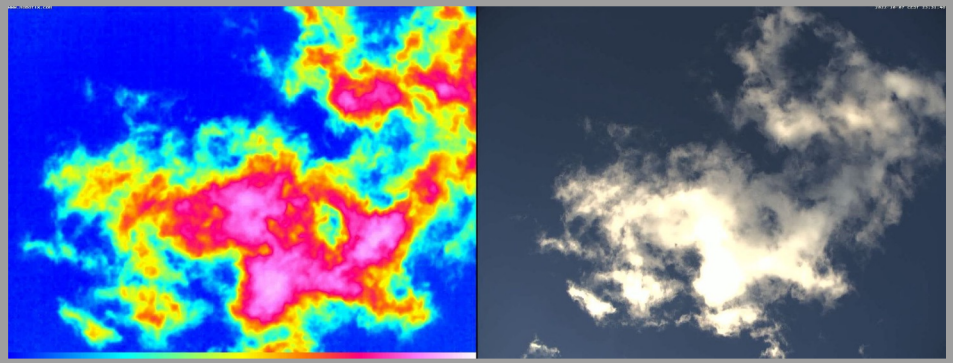


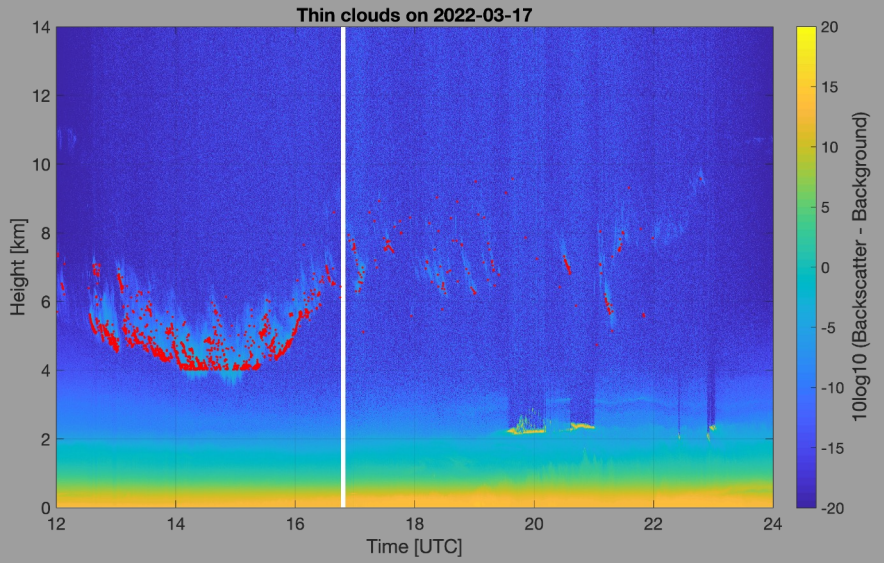
- Day-night sky monitoring without sun-glare, shadows and lighting effects.
- Cloud-base temperature, cloud-base height, and cloud-optical depth.
- Cloud motion vectors with height estimates will be comparable to wind data.





ML models can be trained on this data to retrieve CBH and COD.





- Co-located ceilometers, miniMPL measurements provide training data for AI/ML models for better retrieval.

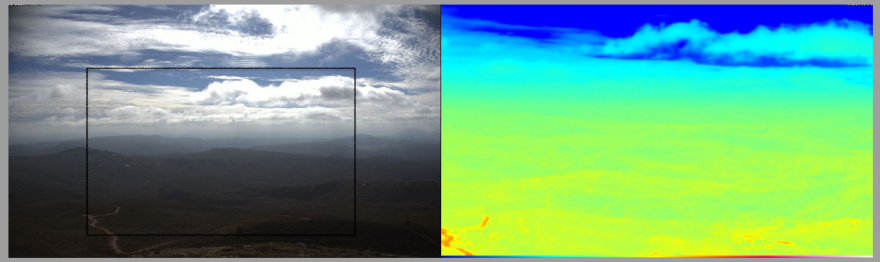
Relevant studies:

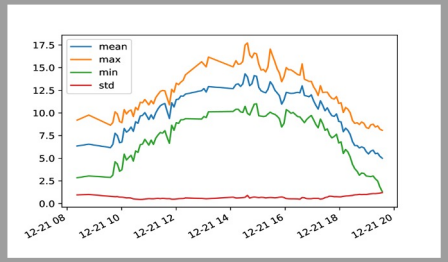
Aebi, C., Gröbner, J., & Kämpfer, N. (2018). Cloud fraction determined by thermal infrared and visible all-sky cameras. *Atmospheric Measurement Techniques*, *11*(10), 5549-5563.

Smith, S., & Toumi, R. (2008). Measuring cloud cover and brightness temperature with a ground-based thermal infrared camera. *Journal of Applied Meteorology and Climatology*, *47*(2), 683-693.

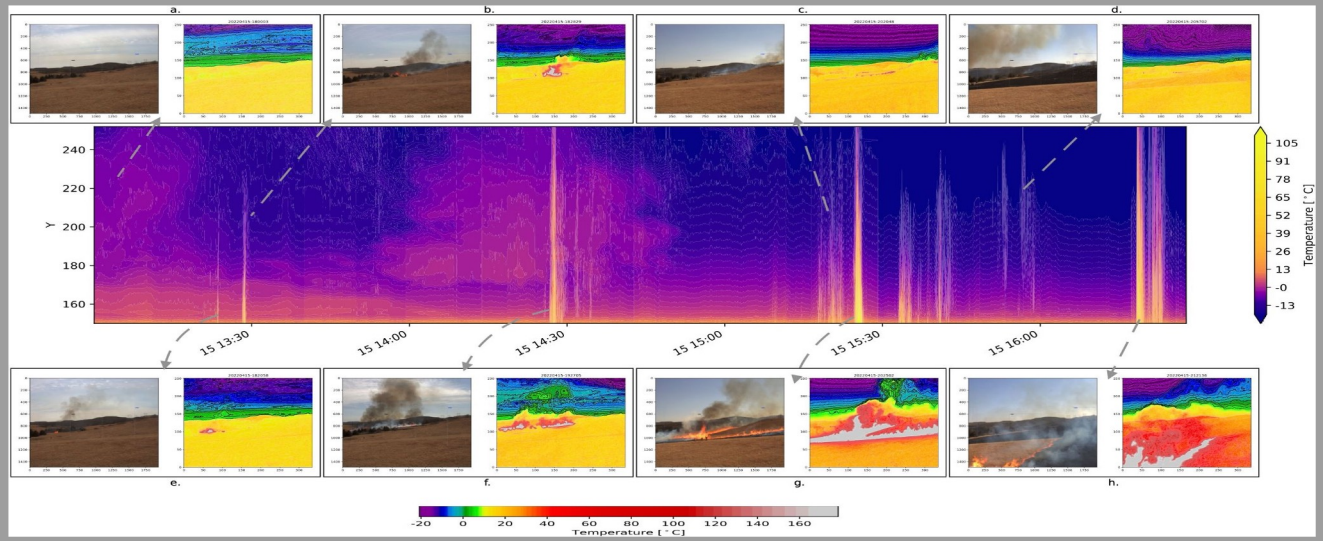
Thurairajah, B., & Shaw, J. A. (2005). Cloud statistics measured with the infrared cloud imager (ICI). *IEEE Transactions on Geoscience and Remote Sensing*, *43*(9), 2000-2007.

Other Applications





Land Surface Temperature



Wildfire Smoke Detection

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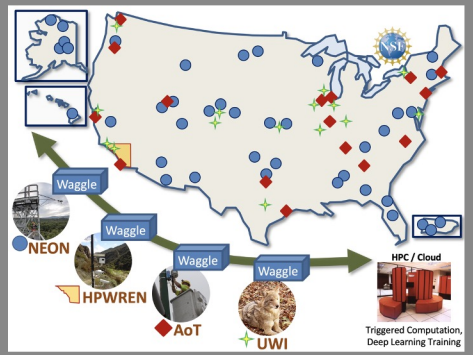

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