



Novel Techniques for Satellite-Based Fog Retrievals in the Namib Desert

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This contribution presents novel extensions of classical - spectral-test-based - satellite fog retrievals using a combination of automated image segmentation and machine learning techniques to study the temporal and spatial patterns of fog development in the coastal Namib desert.

In the hyperarid Namib desert, fog is an important source of water and thus a key component of this desert ecosystem. Despite its ecological importance, spatial and temporal patterns, as well as the main drivers of Namib-region fog are still largely unknown. In order to better understand the drivers of spatial and temporal fog occurrence, as well as its susceptibility to changes in climate, spatially and temporally complete observations of Namib-region fog are needed, and satellite imagery has the potential to meet these requirements.

Typically, satellite-based fog retrieval techniques feature two main weaknesses:

- 1.: Retrieval techniques often lack appropriate spatial or temporal context.
- 2.: Retrieval techniques using passive sensors need assumptions on vertical water distribution to detect cloud base height to discriminate between low clouds and fog.

This contribution presents novel attempts to improve existing retrievals using the Spinning Enhanced Visible and InfraRed Imager (SEVIRI) instrument by using automated image segmentation and machine learning techniques to explicitly consider the outlined weaknesses. Automated image segmentation is applied for its potential to use spatial context for the detection and distinction of coherent pixel regions. Cloud base height is estimated by combining ground- and space-based lidars with the passive SEVIRI imagery in a machine learning system. While the results of the new approaches are presented for the Namib region, the applied techniques may also be transferred and applied to other regions.