P-1-18: Fog droplet distributions and liquid water fluxes in the hyperarid Namib

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Fog intensity (LWC) **highest** during the **first 2-3 of 5 h** of fog

Fog in the hyperarid Central Namib

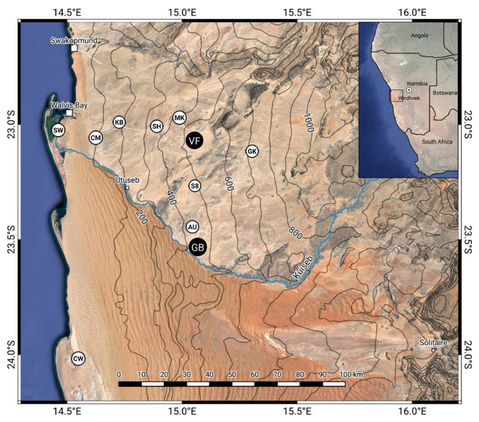

Fig 1: FogNet stations in the research area in Namibia. FogNet stations with a temporary installation of CDP+Sonic setup highlighted in black.

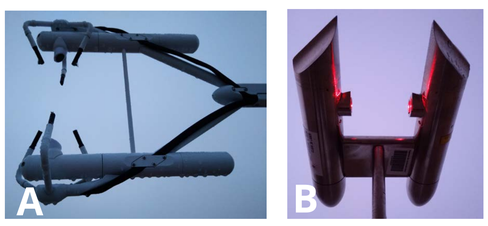

Fig 2: Sonic anemometer (IRGASON, A) and cloud droplet probe (CDP, B).

Nocturnal fog in the Central Namib is linked to an advection of the quasi-permanent stratus layer above the South Atlantic from the Northwest.[1]

Beside standard met. measurements, FogNet (Fig 1) records fog water input with Juvik fog collectors. The derived monthly fog/stratus frequency from these measurements depends on the station's elevation/dist. to the coast (**P-1-21**).

Microlysimeters were installed temporarily for comparison, but measured input appears correlated to amounts of drizzle instead (**P-2-07/P-2-09**).

A sonic anemometer (IRGASON, Fig 2A) and cloud droplet probe (CDP, Fig 2B) setup deliver information about fog characteristics: droplet size distribution (**DSD**), liquid water content (**LWC**) and turbulent liquid water flux (**LWF**).[2,3,4]

The setup of CDP+Sonic was deployed in turn at Gobabeb (GB), Vogelfederberg (VF) and GB again (black markers in Fig 1). More than 150 fog events between the two stations of varying duration/intensity/fog water input were recorded.

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Fog droplet distribution

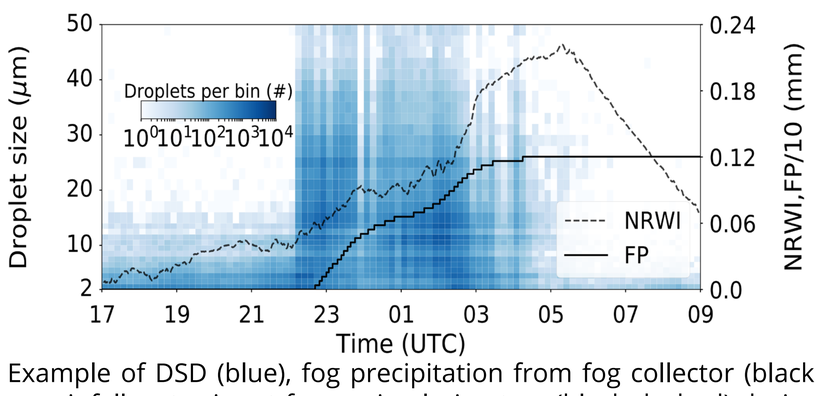

Fig 3: Example of DSD (blue), fog precipitation from fog collector (black solid) and non-rainfall water input from microlysimeters (black dashed) during a fog event in Gobabeb (27-28.9.2017). Note that FP is scaled down.

Fog events in Gobabeb are dynamic over their life time and fog water input (NRWI/FP) appears to react to an short decrease of droplets numbers (Fig 3).

Droplets up to ~40 µm are dominant in Gobabeb. Droplets below ~14 µm contribute little to LWC due to their small size (Fig 4A/C).

A decrease of small and large droplets (<10 and >40 µm) indicates a weakening after ~3h (Fig 4B/C).[5]

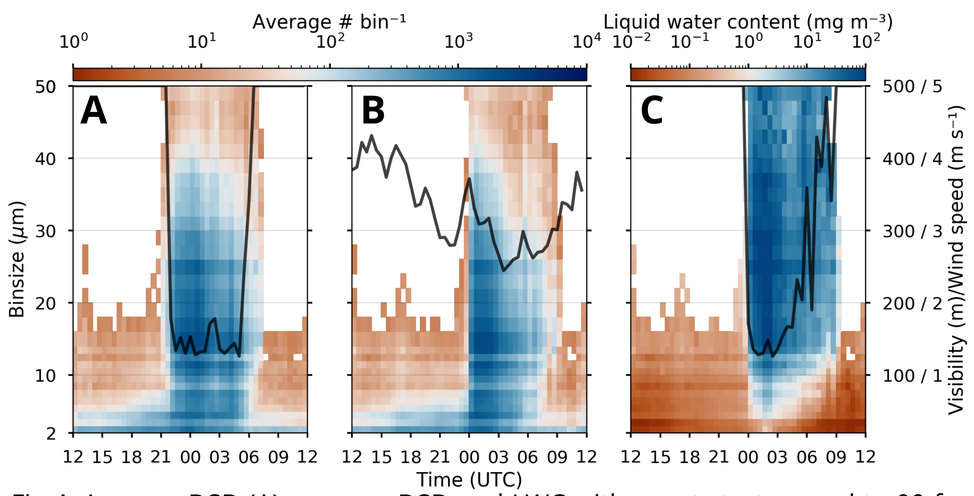

Fig 4: Average DSD (A), average DSD and LWC with event start moved to 00 for all events (B, resp. C) in Gobabeb on fog days. Black lines represent (moved) visibility (A/C) and wind speed (B).

Liquid water flux

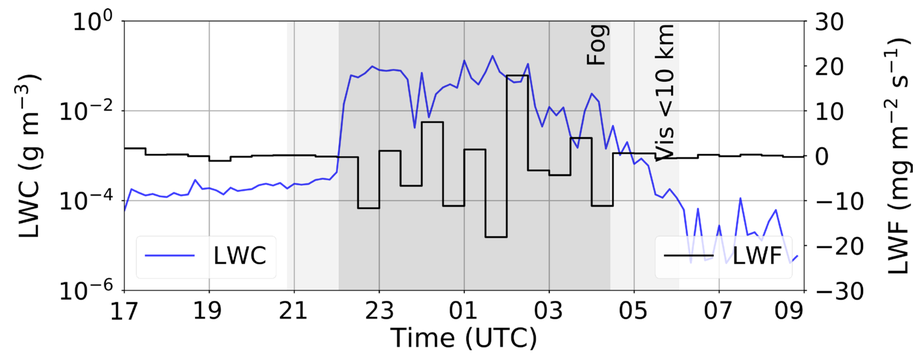

Fig 5: Example of LWC (blue) and LWF (black) during the same fog event in Gobabeb as in Fig 3. Visibility in the background (grey). Total LWF over the event was 60 mg/0.06 ml.

Total LWF over the course of one event is typically downward but upward fluxes are not negligible and show no correlation to LWC on a 30 min basis (Fig 5).

Total LWF at Gobabeb (Fig 6A) and Vogelfederberg (Fig 6B) appears to be a net gain for the surface over time but the total amount varies considerably and requires a more detailed analysis and selection of single, typical events.

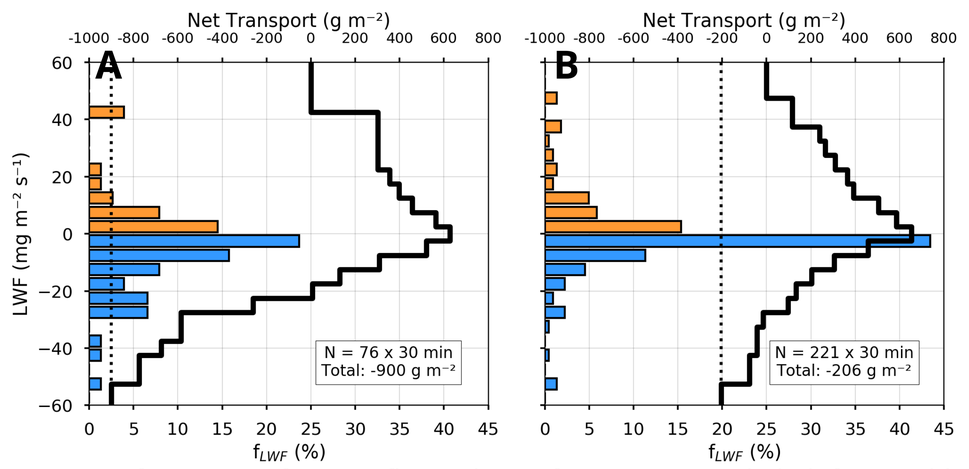

Fig 6: LWF frequency of 30 min fluxes during fog events in Gobabeb for roughly one fog season (A) and Vogelfederberg for a whole year (B). Blue (orange) bars denote downward (upward) fluxes. Black lines represent the cumulative sum of LWF for N events.

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Selected References

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[2] Aubinet, M., T. Vesala, and D. Papale, 2012: *Eddy Covariance*. Springer Atmospheric Sciences, 451 pp.
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