Interactions between high clouds and winds over the Indian Ocean observed with Aeolus spaceborne Doppler Wind LIDAR

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Introduction

Using CALIPSO observations and reanalyses, [*Das et al., 2011*] found a correlation between cirrus cloud cover and Tropical Easterly Jet over the Indian Ocean



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Aeolus : first spaceborne joint wind – cloud profile observations at global scale

Can we relate thin cloud covers over the Indian Ocean to advection from deep convection?

Aeolus joint wind and cloud profiles





fully attenuated

Aeolus joint wind and cloud profiles



Aeolus joint wind and cloud profiles





Tropics \rightarrow Aeolus, observes mainly the zonal component of the wind (Krisch et al., 2022)





















multilayer clouds over continental India [Ali et al., 2022]



Region of thin clouds and region of opaque clouds



Fully paving each region requires 5 days



One year of Aeolus observations over the Arabian Sea and the Bay of Bengal



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One year of Aeolus observations over the Arabian Sea and the Bay of Bengal



















5 days averaging



1 value = 5 days averaged cloud fractions and wind at one altitude level between 12 and 16 km of altitude



13

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Conclusion for the Arabian Sea and the Bay of Bengal

Deep convection onset over the Bay of Bengal and India in April 2020

- → regular days of CF opaque > 50%
- \rightarrow maximum of upper troposphere divergence in August

Tropical Easterly Jet onset in late May

- $\rightarrow\,$ between z=15 and z=18 km
- $\rightarrow\,$ first occurrences of CF thin >10% over the Arabian Sea

Weakening of Tropical Easterly Jet in September as Asian Summer Monsoon decays

- \rightarrow maximum of upper troposphere convergence in September
- \rightarrow lowering of CF thin over the Arabian Sea



Fully paving each region requires 5 days











Closer from the Equator, CF thin > 10% are observed all year long unlike North Arabian Sea

Tropical Easterly Jet onset in late May

- \rightarrow between z=14 km and z=17 km (lower and thinner than over North Arabian Sea)
- \rightarrow z_{top} of the Tropical Easterly Jet matches z_{top} of thin clouds over South-West Arabian Sea

Continental air intrusions from Africa (eastward zonal winds) during periods of 10-20 days reduce CF thin over SW Arabian Sea

In the future ?

- \rightarrow Refine the study considering temperature gradients in the upper troposphere ?
- \rightarrow Understanding the presence of thin clouds few km above opaque clouds
- \rightarrow Extend the study to Subtropical Jet Streams

Backup

