WHY Aerosol-cloud interactions constitute one of the largest uncertainties in climate research. To extend our understanding (beyond processes in microphysics) we turn to global observations. Here, correlations of aerosol and cloud properties (both retrieved with the MODIS sensor) are explored to provide clues on aerosol-cloud interactions and to assist in evaluations of theoretical concepts in global modeling

AEROSOL-CLOUD INTERACTIONS

Correlations among retrieved properties with the MODIS sensor

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CONCEPT

A. pick a pair of MODIS 1°*1° lat/lon daily data-sets

B. rank (by value) all data of Property_1

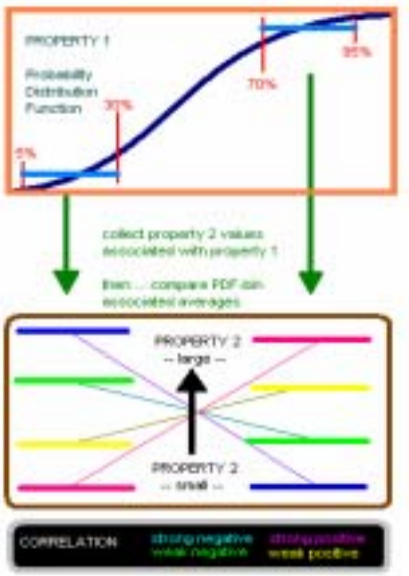
C. determine averages for the values falling into the 5-30% range ('loq') and 70-95% range ('hiq') of the probability distr. function

C. determine Property_2 averages only associated values of ranges (loq, hiq)

D. determine correlation among Prop_1 and Prop_2
+ if slopes agree
- if slopes disagree

E. determine correlation strength from normalized Prop_2 slope steepness *[Property 2 (Property 1)]*

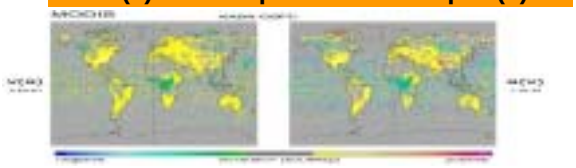
F. repeat procedure by exchanging properties *[Property 1 (Property 2)]*



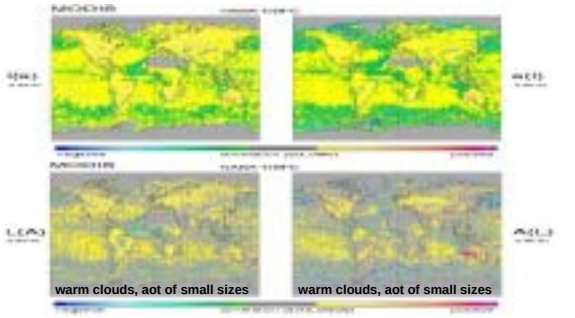
selected correlations ⇨ *on a yearly basis*

a: aot, A: of small sizes (r < 0.5µm)
l: lwc, L: of low clouds (T_{TOP} > 260K)
f: fraction, F: of low clouds (T_{TOP} > 260K)
r: radius, R; of low clouds (T_{TOP} > 260K)
v; water vapor p: Angstrom p.
t: cloud top temp s: radius aerosol

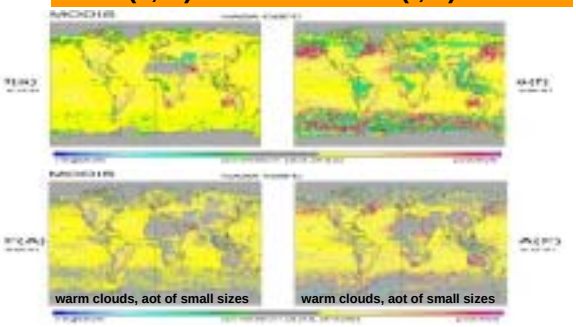
• **aot (a) – atmospheric water vapor (v)**



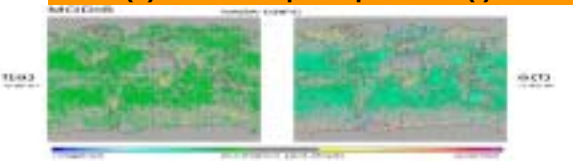
• **aot (a, A) – cloud liquid water (l, L)**



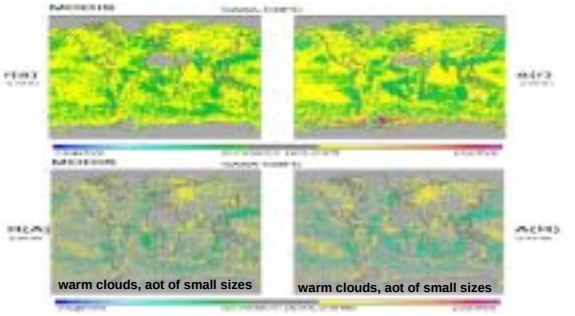
• **aot (a, A) – cloud fraction (f, F)**



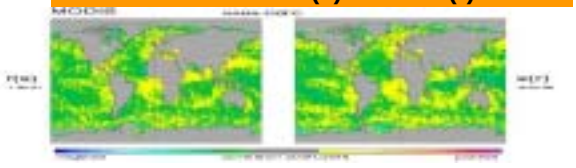
• **aot (a) – cloud top temperature (t)**



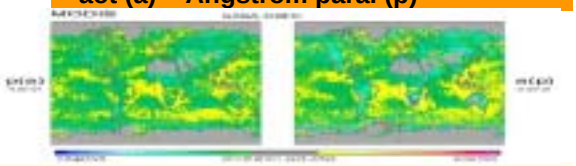
• **aot (a, A) – cloud eff. radius (r, R)**



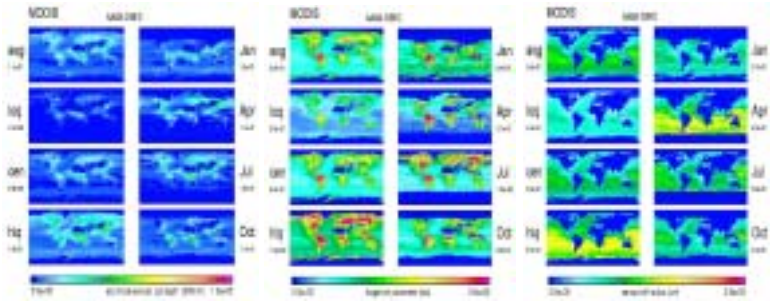
• **eff.radius: aerosol (s) – cloud (r)**



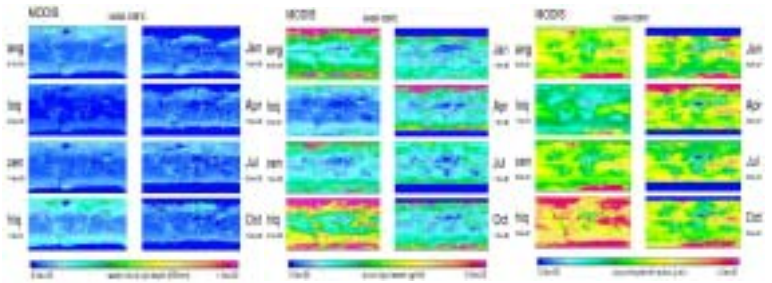
• **aot (a) – Angstrom para. (p)**



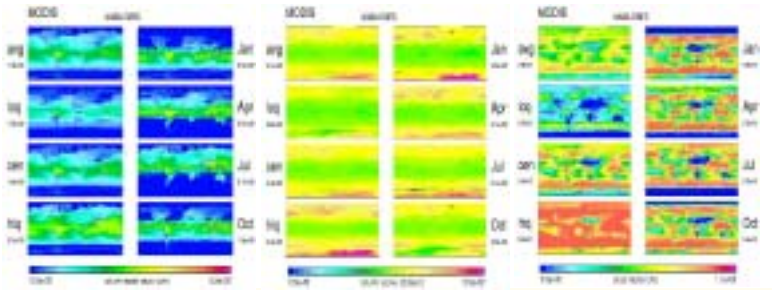
• **aerosol properties** (opt.depth, size [Angstrom, eff.radius])



• **cloud properties** (opt.depth, liquid water, size [eff.radius])



• **trace-gases** (water vapor and ozone) / **cloud cover**



next steps

- investigate correlations on spatially coarser (> 1*1 deg lat/lon) resolution and / or temporal finer (seasonal or monthly) resolution
- include adjacent data-points for better statistics and / or investigate correlations between data combinations (e.g only clouds at low altitudes)
- expand from correlation pairs to correlation investigations involving associations to multiple properties (tighter constraints to interactions)