AeroCom-Aerosat Board for keeping discussions, comments, question and answers
Day 5 October 16
Edit your name, or put your name in front of a comment
Use the agenda to insert comments, Q&As in a chronological order
Let us develop this document jointly, in a stuctured way - can serve as useful minute taker tool
==========

ATTENTION! ATTENTION! ATTENTION! - We will use a different WebEx link for today's AeroCom/AeroSat plenary session:
https://nasaenterprise.webex.com/nasaenterprise/j.php?MTID=md1b7e3c1939fa2bea1168885a63dc958
Meeting number (access code): 199 186 0006
Meeting password: 5BqffdJ2j*4

EU:2:00–3:30pm/NY:8:00–9:30am/CA:5:00–6:30am/JP:9:00pm–10:30pm/CN:8:00– 9:30pm
Plenary Session 10 - breakout-group summaries days 2-4 [45 min]

- breakout session 1 summary	**Ross, Herbert**	(Philip Stier)	[5min]
- breakout session 2 summary	**Laura Wilcox**	(Stefan Kinne)	[5min]
- breakout session 3 summary	**Ben Johnson**	(Duncan Watson-Parris)	[5min]
- breakout session 4 summary	**Jonathan Hickman**	(Kostas Tsigaridis)	[5min]
- breakout session 5 summary	**Ed Gryspeert**	(Johannes Quaas)	[5min]
- breakout session 6 summary	**Thanos Tsikerdekis**	(Andrew Sayer)	[5min]
- breakout session 7 summary	**Hongbin Yu**	(Thomas Popp)	[5min]
- breakout session 8 summary	**Andrew Sayer**	(Ralph Kahn, Larisa Sogacheva)	[5min]
- breakout session 9 summary	**Pekka Kolmonen**	(Adam Povey)	[5min]

5 minutes break

Plenary Session 11 – requirements "new OPAC" ('a-prioiri choices') in-situ / lab meas. [40min]
one slide by moderator with main issues + key questions
Moderator: Ralph Kahn // Rapporteur: Lucia Mona

Rich Ferrare: aerosol hygroscopicity can be obtained via remote sensing. See Dawson et al. 2020
https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2019JD031708
Mian Chin@Rich: I wonder if you have cases with dominant aerosol type, such as dust or smoke, that can be linked to RH?
I don't think either dust or smoke were dominant in the cases presented in the paper. κext = 0.27 (κext = 0.31) at 532 (355) nm
There are new Raman lidars developed in Europe (Volher Wulfmeyer's company) that measure water vapor, temperature, aerosol backscatter and extinction at high temporal and vertical resolution that can do this even better than demonstrated in this paper.
Greg: Good point, Rich. See also my 2009 GRL paper doi:10.1029/2008GL036576.
I think that it is also worth pointing out that there are plenty of problems with in situ measurements. Hygroscopicity is not an easy measurement, as one can deduce by the many papers that are not able to produce column AOD with in situ profiles in moist atmospheres. Mass extinction efficiencies require the aerosol density, which is not routinely measured (and if I remember correctly, can not be done in real time. Requires laboratory samples). Many size distribution techniques require assumptions about refractive index and spherical shapes. Finally, in situ refractive indices are very similar to remote sensing. People measure size, extinction, and absorption, and then iterate refractive index in a Mie code to obtain refractive index. I agree that we need in situ, but they are not the "truth" that some people believe them to be. They are difficult measurements that require people with special skills.
Ralph: For in situ measurements, especially from aircraft, it is critical to sample each aerosol air mass type adequately to capture the PDF of the particle properties. This in part addresses the uncertainties in individual measurements. Another part is making complementary measurements to capture uncertainty. For example, if you measure hygroscopicity inside the aircraft from a tandem DMA, you also measure the ambient particles with an open-I nephelometer and the ambient RH. This makes it possible to compare the internally derived hygroscopicity with the ambient measurements. Similarly, if you have an open instruement coarse-aerosol /cloud probe, you can test the size-dependent efficiency of the inlets, and compare to the standard estimates of inlet efficiency.
Greg: You echo my point that it is not easy. Moving HTDMAs are relatively new. When I wrote my 2009 paper, there were none and I could only find one long-term HTDMA measurement site (at ARM-SGP). I recall the LARGE group testing a moving HTDMA in a large van during the SeaC3RS in Texas, and that is the first one that I know of. It is flying now, I believe, but it is probably not at "turn-key" instrument. Likewise, the open-I nephelometer is very new and requires special training. It captures both fine and coarse modes, so it would provide an apples/oranges comparison to the HTDMA. The particle sizes provided by the open-I neph require conversion of a scatttering phase function into size (just like satellite retrievals). The information content of the open-I neph is much higher b/c there are more angles and less issues like surface albedo, but it still relies upon a single-scatter model that iterates particle size and complex refractive index. It also requires a particles shape assumption.
Ralph: There are *always* uncertainties in measurements. But systematic in situ measurements, if the payload is well constructed, would make a substantial contribution beyond just what we have now.
Greg: Agreed. But systemic measurements with prototype instruments will have some hurdles to overcome. I agree that we need a program for systemic measurements, but well, we haven't demonstrated that it can indeed be done in the way that you describe. We still need to determine the robustness of some of these measurements before making them routine.
Andy Sayer: many (most?) satellite retrievals, and AERONET inversion, treat dust as a mixture of oblate and prolate spheroids. Most use the Dubovik JGR (2006) shape distribution (Figure 13 of https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2019JD031708). This was constrained with lab measurements of Feldspar at 440 and 630 nm. Unfortunately, there were not many measurements to use to constrain. It works well but there is a danger that this might not be the case at wavelengths far from the visible, e.g. retrievals in the UV and swIR. (1) Are there/can we find newer measurements covering a broader spectral range to check/update? (2) Or is there some other way we can tell whether this is sufficnet? (3) It is not clear that this is a problem, but it is also clear that it is not. ;) Might also be more acute for polarised measurements than intensity. (4) Perhaps this is a topic for a future AeroSat experiment. (Many groups are interested in this and/or have been taking steps in this direction recently.)

- Oleg: I agree with you (AS) that our spheroid model as most of models are based on very limited measurements data base (mostly 2 wavelengths). There is no doubts that it' highly desirable to extend that measurements data base. I would like to note thatthere are numerous effort to improve the non-spherical model and to establish the model based on the

more adequate/sophisticated shape. For example, one of promising approach is based on super-spheroid model by Lei Bi team. This model has additionaldegree of freedom (roundness) compare to spheroids. One of most promising features is possibility to get quite adequate phase matrices for small axis ratios (even 1) that are comparable with spheroid mixture (mixing spect ratio from ~1.4 to 3). At the sametime, there is no to evident sharp differences with spheroid mixture. Lin et al JGR 2018: https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2018JD029464

- Ralph: some algorithms (e.g. MISR) have not had success with spheroids.
  - Oleg: Recently we have applied our GRASP approach to MISR data and didn't see any specific issue in fitting.
- Bastiaan: We were interested in the super-spheroids, but it has the inconvenient issue that it is a Chinese model and it's difficult for us NASA to collaborate with the team because of restrictions....+1

Peter Colarco: For the modeling...shape it seems it can enter in several ways. One is impacts on settling velocities, which in GEOS we haven't fussed much with but I know others have (Ginoux 2003). Probably there are relevant shape things with respect to the dust indirect effect. And of course for the optical properties...this we have played with. In lieu of doing our own calculations we started from the tri-axial database of Meng et al. (2010). The database was based on various theoretical techniques and spanned a range of size parameter, refractive index, and shape/aspect ratio combinations. As a practical matter had to sample from the database for our choices of refractive index and shape distributions. We tried a couple of distributions, one was Oleg's spheroidal model, which is what we use at present. In practice this helps us to more realistically calculate the scattering from our dust aerosols for the observation simulation/emulation stuff discussed earlier (it does not, however, solve this perfectly...we do not get realistic depolarization ratios, though they are better than for spheres). Additionally, significantly, we got about a 25% enhancement in the mass scattering/extinction efficiency in the SW from using non-spherical optics. This has real consequences to the simulation of the AOD and the aerosol direct effect. Since we generally tune to AOD it has a practical consequence of tuning down emissions. On the other hand, as was raised many times here, we need better accounting for the coarse dust particle mode. There are limitations in the Meng database, too coarse in the spectral resolution and size parameter resolution, limits on the refractive index range considered.
I would think from a modeling point of view we could work together to develop consistent lookup tables and maybe even consistent recommendations for bin number and spacing (for sectional models, which most are for dust...sorry modal folks).

- Andy: thanks Pete. The comment about depol ratios not being realistic suggests that it might indeed present more of an issue for future polarimetry.

Claudia Di Biagio (ACTRIS representative): Update on lab experiments, how to define new experiments (5 min)
Discussion (35 min): concrete requirements for "new OPAC"

Philip: I might have missed something (sorry) but it is not clear to me why we need a new OPAC... What concerns me is that direct meaurement of radiative properties without relating this back to material constants will make it impossible to ensure consistency between direct and indirect effects in models. There still exist models that have different assumptions for water uptake (direct effect) and activation (indirect effects) – which we should really avoid...

- Adam: IIRC, some of the basic details haven't been updated for the last decade of observations, particularly vertical distribution. Your actual point about consistency is an important concern, though.
- Greg: Yes, needs updating. For example, Bond and Bergstrom 2006 recommended that the OPAC BC be retired, as they could not find measurements to back it up. The sulfate in OPAC can be traced to sulfuric acid. The dust is too absorbing in the SW.
- @Adam and Greg: totally agree that we need updated measurements and a database for all of this (as started by the Oxford EODG group) - but don't think that compilation into something like OPAC will deliver consistent models. Models need representative spectrally resolved refractive indices, and representative measurements of hygroscopicity, ideally something on the mixing state – and maybe something on morphology (but that normally goes too far).
- Yes, but I believe that some people are still using some of the OPAC species. To the extent that we "replace" OPAC, that might induce them to stop using it.
- Claudia Di Biagio: Yes, I agree that the definition "a new OPAC" is misleading. OPAC is oversimplified as it is basically 10 components with lognormal size and refrcative index, components that can be mixed as the user wishes. We need to go towards spectrally-resolved data for natural mixtures;
- then there is also the question of "natural variability" and aging effects, that means that it does not exist an "aerosol type" in nature even if we look at a single specie (dust, BC, ...). Optical properties can change with the source and further modify during aging. The extent of this variability should be understood if you want to have a reliable representation in models (see dust vs mineralogy for example).
- OPAC assumptions about hygroscopicity can be off

Mian Chin: Wavelength range? Any measurements of inorganic aerosols (sulfate, nitrate) and OA (other than brown carbon)? Also BC? Sea salt?
Claudia Di Biagio: https://acp.copernicus.org/articles/15/3339/2015/ here some work on the optical properties and hygroscopicity of SOA from the ozonolysis of alfa-pinene, a biogenic VOC
@Mian: mostly focusing on dust, BC, BrC, ashes now, but we can talk about the possibility to work on inorganic salts
Svetlana to @Claudia : you mean it would be wrong to use SO4 ext. efficiencies for polluted regions... should one then use "soluble" ones for also SO4?
Claudia Di Biagio: what I have understood from the OPAC publications is that the sulfate is thoght to represent stratospheric and Antartic aerosols, but I am not really sure of what this means and what is the applicability; the WASO is probably more appropriated?
Svetlana: Thanks! I should probably performe some model tests....
Paul Zieger: What is the idea behind the "new OPAC"? Should it be a similar, simplified model as the old OPAC? Do you plan to exploit existing (in-situ) data sets? Concerning the aerosol hygroscopicity and particle size, there is already a large amount of data available. Concerning the hygroscopic growth in the original OPAC: The original OPAC growth factor values are too high especially in the intermediate RH range. In our 2013 paper, we provided updated hygroscopic growth factors as a quick fix for OPAC (https://acp.copernicus.org/articles/13/10609/2013/)
@Paul: thanks! yes, we consider to combine with the literature in situ data as a general approach. I was just focusing on our activity in the presentation, but much work is available from other groups, even if approaches are somehow different and should be considered.
For OPAC, see my previuos answer to Philip

Paul: In Maria Burgos's paper, we have also compiled particle light scattering (full and backscattering) at 3 wavelengths (450, 550 and 700nm) global dataset that is covers various defined RH range (and also for PM1 and PM10): https://www.nature.com/articles/s41597-019-0158-7 (data set is available on EBAS and ACTRIS database)
Claudia: yes, a very nice paper

Paul@Claudia: What are your plans concerning sea salt? We are operating a sea spray simulation chamber at Stockholm, which also provides water-temperature dependent properties of sea salt. There is a lot of data concerning size, chemical composition, hygroscopicity around (and published). Let me know if you need input here.
@Paul: thanks! We still do not have plans on sea salts at CESAM, but expertise on sea spray lab experimentation would be welcome

Greg: Very nice talk, Claudia. Are there any plans to determine refracitve indices for Goethite? There are many people looking for this, and it would be very helpful for understanding the SW spectral absorption of dust. The hematite/goethite ratio varies regionally, and so does the spectral absorption of dust (e.g., red vs yellow dust).
Claudia: there is some literature on the refractive index of goethite and hematite, some old work; we see the different SW signature of dust with different origin and iron content and speciation
https://acp.copernicus.org/articles/17/7175/2017/ and https://acp.copernicus.org/articles/19/15503/2019/
Christoph: I'm very interested to get updated refracrive indices for different types of mineral dust and volcanic ash for use in modelling (from UV to IR). Are you also able to analyse meteoric dust that is seen in the stratosphere (metals)?
@Christoph: yes, many published data on mineral dust, and to come for volcanic ashes; meteoric dust is possibly assimilable to dust in some way, what is the mineralogy?

- Adam: A range of ash refractive indices can be found in https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/2017JD027362 and http://eodg.atm.ox.ac.uk/ARIA/data

Mian@Claudia: Will you be able to measure the refractive indices beyond 16 micron? In the modeling work we uses wavelengths from 0.25 to 40 micron

- Claudia Di Biagio:yes, models go towards 40 µm, but it is relevant what you use beyond the 8-12 µm? I mean, there is relevant signal at 20-40 µm wavelength?
- Claire: There seems to be significant extinction beyond 12 microns - e.g. see figure 6 https://acp.copernicus.org/articles/19/15353/2019/ here
- Claudia Di Biagio: yes, I see but I wonder how much this counts when considering the intensity of outgoing LW radiation, that for 300 K blackbody peaks at 10 µm wavevelength and it is reduced to 1/3 at >20µm, anyhow
    - Claire: Yes, fair point. I could probably quantify it by digging out some old calculations...
    - Zhibo Zhang @Claudia: but no other aerosols can have extinction at 40 um. So this might be useful from the perspective of remote sensing. If we can find a clean window band in this region, then we might be able to use it to detect dust.... just a thought
    - @Zhibo: to test, but not sure the signal intensity could be high enough
- Zhibo Zhang@Claire: very interesting! I just realized that the size parameter of dust change from ~3 um to 12 um is about a factor of 4 and similarly from ~12 um to 40 um also factor of 4. So in terms of size parameter 40 um is not that large.
-

Zhibo Zhang@Claudia: How well can we predict the LW dust refractive index if we know, say, the refractive index at the SW and some hints about dust composition? Or the other way, how well can we predict the RI of SW if we know LW RI and some information of composition? Theoretically we should do this, I'm just wondering how well can theory predicts the experiment results.
@Zhibo: for the SW we found linear relathionship between the amount of iron oxides and the imaginary refractive index, meaning that you can predict SW absorption if you can predict dust iron oxide content, see https://acp.copernicus.org/articles/19/15503/2019/
Greg: Claudia and Chrisoph -- you are probably already away of the many dusts that Hans Moosmuller group has in stock. doi:10.5194/acp-16-10809-2016 . No refractive indices, but many many samples. Hans would probably be willing to share for a collaborative effort. Let me know if you need his contact info.
Claudia Di Biagio: yes, there is also this nice work of the Moosmuller group as well https://acp.copernicus.org/articles/16/10809/2016/
thanks!
thanks!
Greg --> Andy: Oleg's code has the flexibility to accomodate different aspect ratio distributions, but nobody plays with it. Need more measurements Andy: thanks Greg, agreed!
Claire Ryder: In response to Ralph's question about other field observations/lab measurements being done, there is a very interesting campaign led by Vassilis Amiridis (ASKOS) planned. They will look at dust orientation, shape, charging and size. Originally it was planned for Cape Verde July 2020, but postponed due to Covid. May be worth catching up with results as and when the field campaign has taken place. Thanks for a nice summary of CESAM capabilities and new results available, Claudia.

Zhibo Zhang @ Claudia: Your retrieval of RI is partially based on the Kramers–Kronig (K–K) relationship. I'm wondering how well can this relation quantitatively predict the mixture of aerosols at different wavelengths? For example, if half of a dust particle is quartz and half is calcite, does the refractive index of the particle follow the simple mixing model, e.g., K-K relation or even simple mass mixing?
Claudia: mixing models are not always so good/easy to apply, but to test

15 minutes break

EU:3:45–5:15pm/NY:9:45–11:15am/CA:6:45–8:15am/JP:10:45pm–0:15am/CN:9:45–11:15pm
Plenary Session 12 - new retrievals: strengths, limitations, new developments [90min]
one slide by moderator with main issues + key questions
Moderator: Adam Povey // Rapporteur: TBA by moderator
- **Robert Levy**: GEO-LEO synergy of different groups (5 min)
Tero: Really nice talk, Rob! I'm sure there a lot of obstacles but GEO-LEO synergy seems like the best way forward. We really need a better temporal resolution of observations.
Robert Levy: Thanks, Tero.

- Andy Sayer: there is a recent initiative called GeoNEX to put GEO data on a common grid and format, including overlap where applicable. I don't know too much about it. https://www.nasa.gov/geonex/dataproducts I only heard about it third party, not through any official NASA distribution. Also not clear to me if it would make it easier to combine with LEO data. I know Alexei has used both in MAIAC so possibly some code he has could be adapted. Also, Wisconsin here have a lot of experience matching and sticking things together.
- Shobha: Andy, yes. But so far they only have 6 months or so MAIAC algorithm run on AHI. Moving data through cloud seem to be the only option going forward. But is very expensive and may prove cost prohibitive. This is a challenge we all have to think about on how to solve.
    - Andy: good point, Shobha - I know you have a lot more experience with the GEO stuff at NOAA too. Agree it is a challenge, especially for this new generation of instruments with more channels and timesteps.
    - Shobha: Right. Cloud providers are trying to make money. Future missions should negotiate with providers and make it cheap.

Robert Levy: Yes, Andy, thanks. we are aware of GeoNEX. It is not the direction we decided to go with our project, (we previously had invested in other systems, before GeoNEX was in place). Yes, we invested in Wisconsin infrastucture. Crazy, the biggest obstacle is moving data around. 'The Cloud' is in our future, but we are already heavily invested in "DAACs" and other archive systems.

- Yingxi: I always wondering what is the pros and cons of using normal gridded format as what we usually do in atmospheric community vs. what land community use for the sinusoidal grid. I found sinusoidal format is hard to chase back to the exact MODIS granule, which might be a problem if one wants to know details of data quality. Because within one grid, the data is uniformly changed due to observing angles.

- **Felix Seidel**: “Beyond AOD”, quantify vertically resolved aerosol absorption (5 min)

Mian Chin: absorption aerosol concentrations are much lower at higher altitudes and I would think it will be much harder to retrieve. What are the anticipated retrieval sensitivity?

- Andy: We are starting now to try and figure out what would be needed and what capabilities that would require, how it links to what capabilities are achievable with current and future hardware. I think a nice minimum would be to be able to separate boundary layer from lofted aerosols. This would be the first increment above column average SSA. Also relevant is a size split (fine/coarse AAOD), which I know e.g. Stefan is interested in too.

Kirk: sounds like the beginnings of a review paper?+ :-) □

Yves: How do you tie the aircraft measurements of aerosol absorption acquired during campaigns to your initiative?

- Andy: they can be a test-bed for developing/evaluating potential future retrievals. And identifying gaps which will need to be addressed in the future.
- Kirk: I agree with Andy, and to some extent this has happened in the ACE era at NASA and with OSIRIS

Kostas: I wonder if one way to move beyond AOD is an engineering task to reduce the detection limit for absorption?

- Nick: I doubt if detection limit is a useful concept. What matters is the error, and this will not suddenly become small above a certain AOD threshold. On the other hand, random errors can be averaged out.+1
- Kostas: I was thinking of the AOD high threshold that is required to get a meaningful SSA. Is this an error problem, not a detection limit one?
- Nick: both Sinyuk's paper and my own show there is a grey scale. There is not a meaningful AOD threshold above (below) which you can trust (distrust) SSA
    - Adam: Practically, I think this is a function of using passive imagery. Differentiating absorption from scattering requires a lot of light.
- Kostas: So the 0.4 AERONET threshold for SSA is what?
- Tom Eck: The SSA uncertainty for AOD(440)=0.4 is 0.03, and decreasing uncertainty as AOD increases. There were several studies over a decade or 2 ago that suggested the SSA uncertainty of 0.03 or less was needed for aerosol radiative forcing estimates.The Sinyuk et al. (2020; AMT) paper shows SSA uncertainty as a function of AOD and clearly the uncertainty increases rapidly as AOD decreases for AOD(440)<0.4.
- Nick: a communication tool, but not a scientifically meaningful value.+1
- Thanks
- SSA capability is a fuzzy boundary, I think the AERONET group just had to pick a threshold somewhere.
- Tom Eck: Not so Kirk, it was not picked so casually. From my comment above: There were several studies over a decade or 2 ago that suggested the SSA uncertainty of 0.03 or less was needed for aerosol radiative forcing estimates. The SSA uncertainty for AOD(440)=0.4 is 0.03, and decreasing uncertainty as AOD increases (see Sinyuk et al.2020).
- Andy: AERONET version 3 also has a more detailed uncertainty model (parameterisation of ensembles of perturbed retrievals). Isn't clear to me how much uncertainty is random vs. locally or globally systematic but it provides more nuance than a single threshold/uncertainty. See Sinyuk AMT 2020: https://amt.copernicus.org/articles/13/3375/2020/
- Greg: We need to remember that there are many restrictions for L2 retrievals in AERONET, not just AOD(440) > 0.4. There are scattering angle requirements, number of good angles, etc. V3 has a new parameter called if_Lev2_except_AOD_threshold. WE need to use that. +1+2
    - Kostas: I was not aware of that parameter!
- Nick: Greg, you are right and my own experience is that some of these restrictions are too strict. E.g. Inversion L2 differs from L1.5 mostly by AOD threshold and better cloud screening. Together this leads to tremendous dataloss (30x if I remember correctly) but L1.5 and L2 give other similar results when evaluating models :)
- Greg: Well, L1.5 allows virtually any SZA. So some of the retrievals can be based upon a very small scattering angle range. Also, the residual requirements are much more lax in Lev 1.5 (I am not even sure if they have a restriction for L1.5). You can create your own restrictions, but taking Lev 1.5 w/o any restrictions is very unreliable. +1
- Nick: yet when I use L1.5 with only AOD440>0.4 as an additional constraint, I get very similar model evaluation results as when using L2. However, I have many more L1.5 (AOD440>0.4) observations than L2

- Tom Eck: Nick you have to consider that L2 is a subset of L1.5 retrievals, so to make a valid comparison the L1.5 retrievals that do not get raised to L2 should be compared to L2.+1
    - Nick: maybe, but I guess it depends on what you call "valid" in this context. I never did such subsampling and am only making a statement about multi-year/regional averages of data.
- Greg: But why would you want quantity over quality?
- Nick: My point is that you get better quantity over similar quality :)
- Greg:I don't think taht you are getting similar quality. Try parsing with respect to SZA. Also, if your residuals are 20+%, do you really have a constrained retrieval? +1
- Nick: I'm not talking about individual measurements but about data averaged over regions and several years (hence suitable to model evaluation). This will average out random errors which may be larger in L1.5 than L2.0
    - Tero: Models are also evaluated with case studies, episodes, flight campaigns and "natural laboratories", so in some cases the quality of relatively small number of observations are important even for model evaluation.
    - NIck: agreed. And then there is data assimilation where one purposefully works with daily data.
- Greg: Well, I have to disagree. We already know absorption is non-gaussian. Errors result in many low SSA but the high end is capped as SSA=1. Take the average that includes the extra low SSA data (some values as low as 0.4), and you'll be biasing yourself low.
- Nick: I'm not disputing your findings but why would you dispute mine? :) When I do the numbers, I get very similar model evaluation results.
- Median!
- Greg: Yes, more medians Rob. Maybe we can talk offline, Nick. We are probably at the point to send each other slides.
- Nick: Greg, I'll share some of my results with you after AEROCOM. Look forward to your view on them.
- Greg: Sounds good, Nick -- looking forward to it! and I enjoyed the chat.

- **Oleg Dubovik**: Assessment of multi-angular polarimetry potential (5 min)
Paul Ginoux: I missed the differences between GRASp-HP and GRASP-MODELS. What are they? Thanks.
I simply didn't have time to described them. In summary, the simplest "Models" shows better performance for AOD. The more complex approaches have notably bigger biases for AOD, but they provide some advantages for AE, AODF, AODC, SSA and AAOD. At the same time, there is no significant inconsistencies between GRASp-HP and GRASP-MODELS.
    - Paul@Oleg: If you have a reference that would be great. Thanks
    - The reference for now:
    - Chen, C., **O. Dubovik**, D. Fuertes, P. Litvinov, T. Lapyonok, A. Lopatin, F. Ducos, Y. Derimian, M. Herman, D. Tanré, L. A Remer, A. Lyapustin, A. M. Sayer, R. C. Levy, C. Hsu, J. Descloitres, L. Li, B. Torres, Y. Karol, M. Herrera, M. Herreras, M. Aspetsberger, M. Wanzenboeck, L. Bindreiter, D. Marth, A. Hangler, and C. Federspiel, Validation of GRASP algorithm product from POLDER/PARASOL data and assessment of multi-angular polarimetry potential for aerosol monitoring*, Earth Syst. Sci. Data Discuss.*, https://doi.org/10.5194/essd-2020-224, in review, 2020.
Thanos Tsikerdekis: Very interesting presentation, thank you! A kinda naive question, why POLDER is able to get better performance in comparison to MODIS over AERONET site for AE? Does it had to do with the nature of the multi-angle polarimeter measurements that can constrain the retrieval better for multiple wavelength AODs?
    - Andy: yep, some of the assumptions which can lead to large AE errors can be relaxed/overcome by the polarimetric and multiangle measurements. For example assumptions about the spectral behaviour of surface reflectance, which is one of the larger uncertainty sources in a passive single-view imager retrieval.
    - Oleg: Yes I agree with explanation by Andy.
    - Thanos: Great, thank you both!

- **Bertrand Fougnie**: How consider the geometry of acquisition on the aerosol retrieval performance (5 min)

Nice to see similar, yet independently determined conclusions from our work
Andy: Bertrand, I read your paper and like it a lot. It is nice and laid out clearly, and I liked that you were able to get quantitative in it. I agree that we should do our best to consider practical scattering angle constraints when doing retrieval simulations and related analyses.Agreed!
Thanks. Was nice to see this considered yesterday on the talk about geometry of polarimeters by Sabrina.
Also, not unrelated to the geometry is the interaction of shadows in your observation. High SZA --> more shadows. In DT retrievals I hope I have statistically removed those shadows, but you have preferential 3D scattering in those shadows. (whether they are from big clouds or tiny buildings)
    - Andy: good point. I know this is an issue for cloud retrievals as well (see eg Zhibo Zhang's work).

- **Kirk Knobelspiesse**: Analysis of simultaneous aerosol / ocean glint retrieval using multiangle observations (5 min)

Discussion (65 min) Most promising breakthrough potentials to improve aerosol retrieval information?

Antti L.: About deriving covariance matrices: We have used AERONET and simulations to derive the (full) covariance matrix in BAR. More info here in the paper (Sect 3.3, Approximation Errors): https://amt.copernicus.org/articles/11/1529/2018/ The idea is to take accurate aerosol information (such as AOD) from AERONET and simulate the TOA reflectance with the LUT used in the retrievals using AERONET values. Then we compare the measured TOA reflectances and simulated and derive the covariance as sample covariance. This will take into account both the observation uncertainties and model approximation errors

- Nick: do you have any idea how important this was in getting a good retrieval? As you know, BAR was performing very well among 9 different satellite products (our joint ACP paper). Is the full covariant the main reason for this, or something else?
- Antti L.: "The results show that the approximation error model plays the most significant role in improving the retrieval accuracy." Tables 2 and 3 show comparison with and without approximation errors (full covariance) so it is important to take these into account, I think that taking all the model (e.g. radiative transfer, aerosol) related uncertainties into account plays a big role here. I would guess the model related uncertainties result into larger uncertainties in TOA reflectances than the observation noise.+1
- Nick: Thanks, Antti.

Kirk: here's a nice book about the 300 year history of the discussion we're having now about the use of priors or not: https://yalebooks.yale.edu/book/9780300188226/theory-would-not-die

- Tero: Thanks!:D +!
- Andy: thanks Kirk - just checked and it is $1.99 on Kindle now, for those in the USA. Purchased as I am using your comment as my prior about its interest to me. ;)

We have not yet utilized our existing datasets yet - like we can use high temporal resolution of GEO - mesoscale views. For example, GOES and Himawari observe at 1 minute or even 30 second intervals at small scenes, or 5 minutes on a sub-continental scale. Way beyond my abiity to handle, but there is information there to tackle 'processes'.

Filling gaps in aerosol retrievals

- Mian: what about aerosol retrievals around clouds? Or integrating above, below, and in between clouds to assemble a "quasi all sky AOD"? Or combining UV and IR information of aerosols within clouds?
  - Andy/Oleg/Ralph: there are some retrievals below thin cirrus (in principle, e.g. Lee JGR 2013, https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1002/jgrd.50806, not yet applied widely), some above liquid clouds (polarimeter as well as imager). Broken cloud is challenging, 3D effects etc, probably not much can be done there right now. Of course lidar (CATS, CALIOP) can function in these conditions too.
- Larisa, Linlu: there are still gaps in retrievals above snow/ice in many aerosol retrieval algorithms. Recent work filling these gaps e.g. Mei 2020 https://www.sciencedirect.com/science/article/pii/S0034425720301012 . But it has been neglected for a long time.
- Kirk: I'm interested in retrieval algorithms that incorporate cloud screening/flagging as part of the retrieval process. Otto Hasekamp and his group has written on this (
- www.atmos-meas-tech.net/3/839/2010/ doi:10.5194/amt-3-839-2010). Snorre Stamnes has a project for PACE that intends to retrieve aerosol properties and a measure of cirrus clouds (essentially treated as another 'aerosol' mode) Snorre's project: https://pace.oceansciences.org/people.htm?id=47.
  - Andy: Marta Luffarelli's presentation was on this topic (retrieve every pixel trying as an aerosol and a cloud). Pekka Kolmomen made some comments about an effort in the ESA aerosol CCI earlier this week. These were binary "cloud/not cloud" decisions rather than "aerosol plus cirrus" though. I know Jeff Pierce did some work with MISR looking at adding a cirrus component to the aerosol retrieval (JGR 2010: https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2009JD013019), but am also not sure of the practicalities of doing that larger scale. Any input from MISR team on this?

Rich F: About half the time CALIOP measures aerosols, there are thin clouds above. Tyler Thorsen has done some nice work with CALIOP data to show such statistics.

When we can all travel again, next AeroSat on a cruise ship! (and we can measure stuff). +1

15 minutes break

EU:5:30–7pm/NY:11:30am–1pm/CA:8:30–10am/JP:00:30am–02am/CN:11:30pm–1am
Plenary Session 13 - recent extreme events [40min]
One slide by moderator with main issues + key questions
Moderator: Larisa Sogacheva // **Rapporteur: Adam Povey**
- **Andrew Sayer**: How consistent are satellite retrievals of smoke from the 2019-2020 Australian fires? (5 min)

Ralph: Andy -- Good points about standard products. I'm thinking these extremes events are situations where aerosol property retrievals *could* be done to advantage, due to high AOD. With the MISR research algorithm, we get really quite good property retrievals over the Australia, California, and Siberia fires, and we account for aerosol elevation in the retrievals as well, using the MISR/MINX stereo height (also a "research" product), again due to high AOD.

- Andy: 100% agree, research algorithms are ideal for this. So the questions would be (1) how do we encourage generation and use of these research products within our existing work mechanisms (as well as/instead of people going to standard productswhich may not be optimal here) and (2) what if anything can we tweak in operational algorithms to improve the situation? (For #2 I would say better population of files and clearer statements of assumptions is a first step. OMI and MISR were good here.)
- Ralph: Regarding Point 1, we have papers, and we continue to generate them for severe volcano and wildfire events. (I'm working on one for Australia just now). Fortunately, journals now allow us (sometimes demand) that we archive our data, so this is becoming available, if others want to use them. Point 2 becomes a bit political, depending on what the standard algorithm team feels is most important.
  - Andy: agree! Rob put #2 nicely as "how to leave the dock without rocking the boat". But I would hope that adding more diagnostic info (in files or in ATBDs/ancillary data bases online) would be an easy step.

- Istvan: Ralph and Andy, I agree that research algorithms would likely be more suitable for better capturing the real characteristics of aerosols from extreme events. Air quality applications (forecast) need this type of information in near-real time. Are the research algorithms capable of handling this requirement?
- Ralph: For MISR, not real-time, though our plume heights have been used for air quality forecasting in extreme CA fires. Fortunately, these are still relatively rare events.
- Andy: Istvan, I agree with you about the need for NRT. So if there is something we can improve in the operational processing too, I think that would be important (for that reason and others)

Anin: The tail you have mentioned in comparison plot in the slide #7 could be coming from the spatial resolution mismatch of the two instruments. What is the spatial resolution the AOD products you are using from AHI?

- Andy: I collocated all the data at 0.5 degree, 30 minute resolution (cf. Nick Schutgens' work) and imposed constraints on number of retrievals. Took medians to reduce outliers and effects of skew. I think pixel size differences can contribute to scatter here but not the large systematic differences in distribution shapes. VIIRS is 6 km, at nadir AHI is 5 km, MISR 4.4 km, OMI 12x24 km at nadir

Yingxi: One thing that I am facing when doing research algorithm on those events is that we don't have a truth to validate that this part of the plume is actually smoke or there is cloud start forming underneath. Also at what point do we give up on retrieving at 550 and either switch to longer wavelength or simply just give a flag and not retrieve.

- Andy: yes, exactly - this is a discussion we need to have. I think the standard products are not optimal for extreme events for that reason. A lot of people use level 3 data for comparisons and model evaluation and these will be quite sensitive to the extreme events, as your work has nicely shown for MODIS DT also. We have spent a lot of time focusing on evaluation of retrievals, but not as much on evaluation of where we do/do not do retrievals, and I would like to look at that.

Wenying Su: Andy, I might miss your description of the comparison. Did you also compare the AOD retrievals over ocean, were the agreement better? How much the disagreement can be attributed to cloud detection?

- Andy: the scatter plots in the main presentation were over ocean with colocated data. I have some for land in the backup slides too, but the picture was not too different. Felt best to focus on the ocean as most of the smoke is there, and also the retrievals should be less difficult. And yes, some differences here could well be cloud/aerosol discrimination issues (both over and underscreening).
-
- Shobha: Andy, for Australian fires when fire emissions were generated and provided to NWS global model, model generated very high visible AODs (> 10). No way we can evaluate the model AOD at that point because no imager provides AOD > 5 or cloud mask screens those out. And if models assimilate MODIS or VIIRS AOD they get it wrong because model will be nudging the AODs towards observations. And observations are not realistic. Even AERONET...either smoke did not go over or even if it did once sun is not visible they won't make measurements.
  - Andy: yes, I agree with you! We know if there is no consistency, though, that something is wrong. So it's worthwhile I think to try and evaluate as far as we can and make adjustments where we can. Even though we know AOD > 5 will disagree or be missing, hopefully for AOD up to 1 or so (i.e. above baseline but within theoretical capabilities) we can get better agreement. And if we don't we can point to something concrete to work on (e.g. cloud masking or whatever it might be).

Caroline: Agree with you Andy Australia is a 'perfect storm' of aerosol retrieval problems, not just surface, but low baseline AOD and different optical properties.
Caroline: We collected smoke particles from the latest Australian fires so we can develop Australia specific optical models... Will let you know when we have some data

- Andy: thanks Caroline! That would be great. I would like to tie in AERONET inversions with retrieval assumptions and any other optical properties. Even if we can't fill the gaps we can find where they are.

Dan Robbins my PhD student will be looking at senstivity to optical property assumptions during the fire period.

- Andy: nice! His talk on AHI cloud masking in smoke is of course very relevant here too.

Nick Schutgens suggested also doing an evaluation in Australia during "non-extreme" times, in order to provide a comparative baseline of consistency. This is a good idea, though the 6 month period looked at (Sep 2019-Feb 2020) does contain a lot of "normal" conditions over much of the continent, it is perhaps not enough. Also, practically, downloading (and storing) the level 2 data is problematic. Could start with this and see how it goes.
Caroline: I would be very interested in being involved with that, I think 6 months would beenough to give a good story. Thanks! :)
Xiaohua: Andy, you mentioned about the difficulty to download MODIS data. You may try to send your feedback to LAADS, MODAPS User Support at MODAPSUSO@lists.nasa.gov. According to my working experience in GES-DISC so far, DAAC takes user's feedback seriously.

- Andy: I have sent feedback to DAAC people on various issues, numerous times. Generally ASDC (MISR, CALIOP) and GES DISC (OMI) seem to be smoother than LAADS (MODIS, OMI). Those are the principal servers for the NASA products I've been using. LAADS is a lot slower than the others and has more frequent corrupt downloads and timeouts. This could be because they have a very wide distribution of data (as MODIS is used heavily). (The AHI download was pretty fast too from JAXA; I don't have any European data sets in this ensemble yet.)

- **Hongbin Yu**: Gigantic African Dust Intrusion into the Caribbean Basin and southern U.S. in June 2020 (5 min)

Ron Miller: Doesn't GEOS assimilate AOD? Is there a large assimilation error? Alternatively, is the AOD being attributed to another aerosol species?

- Qian: This is a GEOS run Huisheng made without MODIS AOD assimilation, driven by MERRA-2 wind
- Ron: thanks for the explanation, Qian.
- Hongbin: for the event like this one with AOD of 1-3, I think dust is a major contributor to the MODIS-GEOS discrepancy.

Paul Ginoux: Do you think haboobs played a significant role along the sub-sahara-Sahel regions? I think the period was particularly wet.

- Claire: Also, haboobs and mesoscale convective systems were very active in uplifting many of the dust events which contributed to this event. I wonder if this contributed to MODIS missing much of the high AOD events over land due to cloud presence?
  - Paul G@Claire: You are exactly right!!
  - Ron: Good points Claire and Paul. Similarly, if haboobs were responsible then GEOS wouldn't have the resolution to simulate them.
  - Qian: https://worldview.earthdata.nasa.gov/?v=-62.05687554638127,-10.116749755257304,32.656402813668,39.664500244742676&t=2020-06-17-T16%3A00%3A35Z&l=Reference_Labels(hidden),Reference_Features(hidden),Coastlines,VIIRS_NOAA20_CorrectedReflectance_TrueColor(hidden),VIIRS_SNPP_CorrectedReflectance_TrueColor(hidden),MODIS_Aqua_CorrectedReflectance_TrueColor,MODIS_Terra_CorrectedReflectance_TrueColor(hidden)
  - Qian: for June 14-18, over land it is relatively cloud free. Off the coast, on June 16, cloud might block aerosol retrievals. On other days, it is relative cloud-free.
  - Claire: Looking at SEVIRI imagery, you can see that uplift actually began as early as 4-13 June, via a series of haboobs with associated cloud.
  - Qian: @Claire, thanks. By 4-13, you mean 4am on June 13, right? Does SEVIRI image available online some where?
  - No, I mean from 4th June till 13th June. I will email you.
  - Qian: Cool, thanks! qian.tan@nasa.gov
  - Hongbin: thanks, Claire.
- Hongbin: all good points. I know that Bing Pu just finished a paper that discusses the atmospheric conditions favoring this event. It is possible that cloud presence may have led to lower AOD in MODIS (Deep blue).

Claire Ryder: Interesting analysis, thanks. I agree with your point about the surface pressure high/low positions - you can also see this in the 700mb winds anomalies, and how this is very weak while the dust is 'accumulating' over the Tropical east atlantic, before the winds pick up again and the dust gets transported westwards.

- Hongbin: I did look into winds at other altitudes. They are quite consistent. Surface pressure pattern in June 2020 was an anomaly over the last 20+ years based on my analysis of MERRA2 meteorology.

Discussion (30 min): How improve representation of extreme events with limited sampling in extreme events?

Adam : The Met Office does assimilate MODIS AOD into something, to improve their dust

- Claire: Into their NWP global forecast model

Plenary Session 14 - closing remarks [20min]
Thomas Popp
AeroSAT closing remarks
(feel free to comment)

1) Online meeting
   - a. Overall went well
   - b. Also lively discussions, very good discipline, maybe some people were shied away by the “attendee” status and need to get unmuted
   - c. Board.net helped collect rich set of comments from many participants – too many anonymous contributions
   - d. Wonder.me allowed even some socialising, but we were missing the shared glass of wine / beer and the traditional Wednesday afternoon local activity
   - e. IF POSSIBLE, next year should be a physical meeting – if not possible, an online meeting makes also sense
   - Paul Ginoux: I would keep board.net for any type of meetings (physical or virtual). It is so great. It provides many dynamic exchanges without interrupting anybody. Can go back.+1+1+1+1+1+1+1+1+1+1
     - Kostas: Completely agree. Whoever found it, thousand thanks, great tool.
     - Mian: board.net was recommended by Bjorn Samset
     - Tero: It also enables everyone to ask questions which is not possible with only "live" questions.
     - Steve: I agree, boarrd.net worked very well. Would be useful to keep around.
     - Xiaohua: and capture and preserve the ideas which otherwise will fly back and forth in the air and are forgotten later.
   - Kostas: The other thing I liked was that we had several time zones on the program, so I did not had to make conversions. +1+1
   - Mian: But we will exclude people and potential participants from Asia, which is not optimal
     - Michael D: Some other meetings, such as ACPC, have done three daily sessions separated by more time (several hours), so one was optimized for US, one for Europe, one for Asia, e.g. Could be worth exploring a schedule more like that, with short summaries of previous sessions for those in an inconvenient time zone.
   -
2) More integration if AEROCOM and AEROSAT sessions on Wed + Thu
   - a. Went very well, but more effort to agree in larger SSC
   - Indeed, sessions discussing shared scientific topics were rewarding.
3) Breakouts
   - a. Went very well and allowed to give more attention to posters
   - b. In future we should avoid 1-slide presentations of plenary talks (which pushed the number of 1-slides too high)+1+1

- Breakout summaries of posters sounds much better than the long blocks of 1-slide intros+1
- Perhaps enforce a strict slide format (e.g. 5 PDFs without animation that automatically progress every 60s)

4) Some science outcomes

- a. Covid-19: complex challenge to disentangle the signal from meteorology, regional trends, natural / transported aerosol due to the lifetime longer than NO2
- b. Comparisons / trends
- i. Unlike for models, satellite product AOD diversity can be used as proxy for their uncertainties
- ii. Comparisons should focus on regions with high discrepancy to better understand the reasons (Australia, over deserts, Southern ocean)
- iii. Consistency of trends between different datasets should be a focus
- c. Optical properties: create AEROCOM / AEROSAT commission of optical properties for annual review; Larisa will analyse definitions in retrievals
- d. Aerosol type
- i. only few multi-spectral AOD operational products (look for other, experimental)
- ii. promising initial application of an interpretation scheme to models
- iii. Emulators could be a middle ground between radiance assimilation and constraining model w/satellite-retrieved optical properties
- iv. (breakout7)future work should focus on specific types, feasible for satellite retrievals + needed for model improvements (dust AOD, fine mode AOD, absorbing AOD)
- e. Machine learning techniques: Few examples of their use, at some point need to do a critical review of strengths and limitations
- including laboratory groups / perspective of more lab measurements towards “new OPAC”
- f. Extreme events
- i. maybe we need multi-sensor (at level 1) retrievals or special processing with different assumptions for these events
- ii. Cloud screening is critical - to allow relaxing it, use a simple fire detection module (for fires), a BT test (for dust episodes), SO2 axillary data or MISR plume height (for volcanic eruptions)
- g. New retrievals: information content / constraints; uncertainties of gridded / averaged products; synergy; systematic in-situ / laboratory measurements
- Satellites provide the global picture, not details – synergy model + satellite + sub-orbital

ca EU:6:30pm/NY:12:30am/CA:9:30am/JP:01:30am/CN:12:30pm
Michael Schulz
AeroCom closing remarks
(feel free to comment)

AeroCom/Aerosat workshop 2020
Thanks all for the very nice presentations
Excellent idea to preassemble presentations, thanks Stefan+
Thanks for the engagement on board.net - minutes are ready:)
Thanks Tom and Mian for coordinating and mastering the webex challenge

Primary near term goal
AeroCom and AeroSat are the best communities to summaries our knowledge on aerosol trends and aerosol forcing over the 2-3 last decades. We have an *indication* that the clear sky direct aerosol effect has weakened, but the trend in aerosol-cloud interaction is highly uncertain. To summarize findings and data on trends will require some work, but should be a primary goal for near term activities.

Commission on Constraining Aerosol Properties ?
Purpose:
Setting up bounds on any useful global aerosol property, which is revised annually.. what should models respect "at least" when simulating global aerosol loads, optical properties and forcing?
Formulate it as Recommendation for Modellers
Revise bounds every year at AeroCom (Bounds: maybe be global averages, or vertical distribution, regional averages, to be discussed)
Create a maintenance framework, With a table that will be updated every year.
Are there maybe measurements missing?

Possibly write an initial paper for announcing the concept+1
Mixed compositon : observational and modelling experts
Volunteers: Kostas Tsigaridis. Rob Levy, Tero Mielonen, Don Grainger/Adam Povey, Yves Balkanski, Pekka Kolmonen, Ralph Kahn, Claire Ryder, Thomas Popp,Nick Schutgens,Peter Colarco,Dave Winker,Hongbin Yu,GerritdeLeeuw, Ying Zhang, Claudia Di Biagio, Michael Schulz, Mian Chin, Betsy, Andy Sayer, Larisa Greg Schuster
Nicolas?

What is needed to pursue the AeroCom experiments?
Revision of wiki and documentation is partly needed.
Coordination of requests - AeroCom SSC will invite for an “AeroCom experiment” telecon not too late, best well before end of year
Model experiment genealogy (versions, participation, overview, commitment) how to document that better?
New questionaries? nitrate ? absorption optics? size? Coupling between various processes?

How to make progress on the "remaining issues" discussed on day1?
Make a list of remaining issues - attach action points
Aerosol life cycle
Dust lifetime and size
sea salt size?
BC and absorption
Nitrate
Organics
Vertical profiles
Biomass burning aging and height (injection height and self-rising)
MEC/AE/FMF/CMF
Hygroscopicity
Clear/all sky AOD and rad flux calculations <- on my list, volunteers for help welcome (Kostas)

Yves: There is work in the group of Jasper Kok on the constraints of dust regional budgets: the work is quite important so it was split between 2 papers:
1) is entiled:
Improved representation of the global dust cycle from integration of constraints on dust properties and abundance
so quite topical.

Vertical pofile comparison with new aicraft measurements
Transport tracers

Biomass Burning Emissions

Shobha: product developers are somewhat handicapped with insufficient information on emissions factors. Especially, for different vegetation type and the vegetation moisture content.
If any of the experiments being proposed take into consideration for these sort of measurements, it will be very helpful to improve fire emissions.

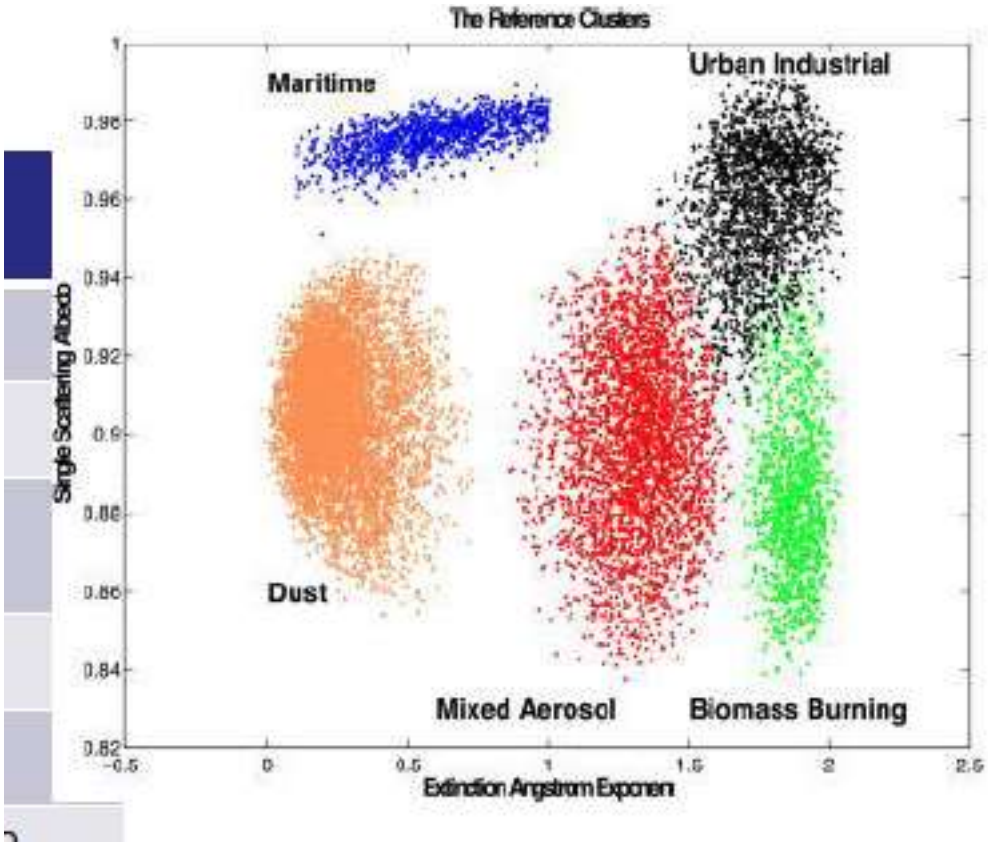
New AeroCom experiments?
board.net contains some nice ideas….need to be extracted and formulated
EG: repeat PI+PD indirect experiments, or include respective diagnostics in CTRL 2020?
Sea salt experiment+2

- Paul Z: Would be interested as well (also hygroscopicity and coarse mode)

Please send propositions to AeroCom SSC
betsy: full size distribution experiment (include AODf/AODc and FMF)? model RH intercomparison?
yves: could modellers produce routinely this diagram (from Tero Mielonen) but for their models. The types could be (SO4, dust, BC, OA, SOA etc...). It give a kind of ID card of what the model is doing. INputs from others welcome!

- Tero: We are actually just preparing plots where we compare the SSA and EAE distributions of the 5 models with the AATSR data in different regions to see how well they compare and if we are able to separate any aerosol types from there
- betsy: the AAE vs EAE relationship might also be interesting to look at (but requires spectral absorption) (see, e.g., cazorla et al ACP, 2013 and cappa et al ACP 2016)+1
- greg: See also doi:10.5194/acp-16-1587-2016. Many of the AAE approaches are unable to account for low EAE simultaneous with low AAE. +1

Mian: That would be comparing apples with oranges, i.e., comparing composition with mixtures of origins
Greg: Phil Russel et al (2014) doi:10.5194/acp-16-1587-2016 was the first to apply this technique to AERONET. That paper leveraged Burton et al (2014) doi:10.5194/amt-7-419-2014 .
I wonder if it would make sense just to make sure that the emissions fall in these places. That is, what are the optical properties of the MEE and MAE lookup tables that modelers use for the different species? Would smoke land in the green region, for instance?
These classifications basically come from AERONET climatology. Basically, BB sites during BB season are used for green, urban sites are used for the black, etc.



AeroCom box model and multi-hypo thesis framework? +1
Some interest and new initiatives on the horizon
Telecon on this ?
Assemble open source code and code bits on aerosol life cycle aspects (emissions, sources, removal)

AeroCom website
MetNo is preparing a relaunch of the website, open to be shared in maintenance by others (Augustin)
Volunteers???
betsy: i could help update text but not any fancy web coding stuff!
Anin: I am happy to help with the front and back end of the website.

Distribute AeroCom products
AeroCom median, mean, std, 25% and 75% percentile fields as reference (Jonas, documentation in Gliss et al 2020)
Model data associated to reference AeroCom papers. (frozen versions)

ACP special issue
Maria Kanakidou agreed in principal to coordinate editing, needs to be followed up

AeroCom 2021, where will it be?
Virtual again ? .... NY, Stockholm, Nanjing
AeroCom/Aerosat SSCs shall decide in winter/spring

Susanne Bauer: I just want to give a big thank you to the organizing team. This was extremely well planned and executed! Well done!!!
Best online conference so far in 2020!!! +1+1+1+1+1
2021 - if we believe the COVID forecasters, they assume that the world will not be normal until the end of 2021. So my bet is another online conference in 2021.+1+2+1+1+1+1+1

Greg: I was muted and unable speak, but I wonder if having shorter days over a longer period of time would help our Asian friends (or whoever gets stuck with the worst time zone). Say 3hours a day for two weeks? Perhaps I have not thought that through, though.
Tero: One option could also be that we would have meetings on two days per week for a couple of weeks. Then you would have some time to rest between the meeting days
Christoph: maybe include Saturday, to cut the meeting into parts would distract too much. The SPARC/SSIRC community on stratospheric aerosol still plans an in-person meeting in April.
--