Norwegian Meteorological Institute

Condensable organics - Summary of issues and NMR workshop

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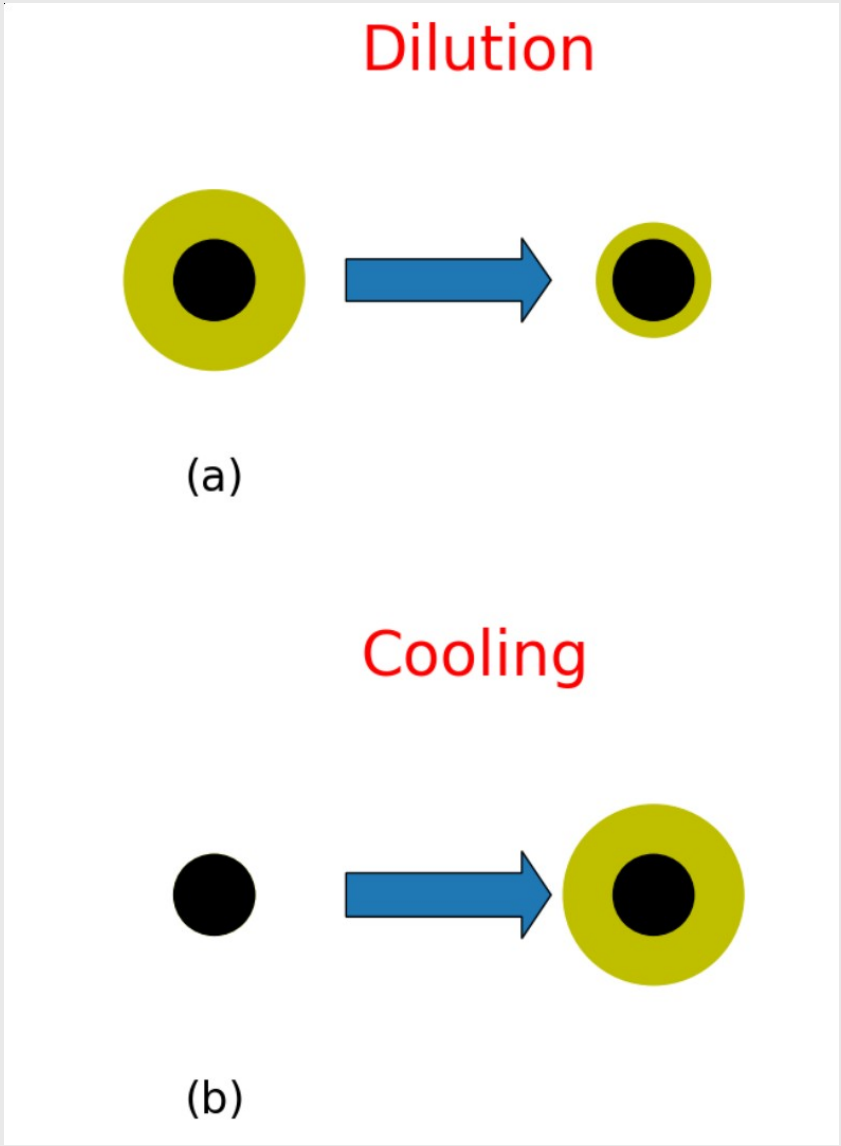
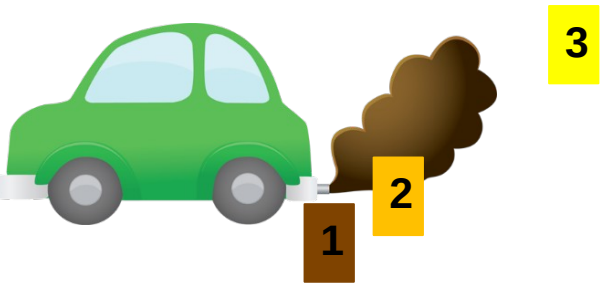
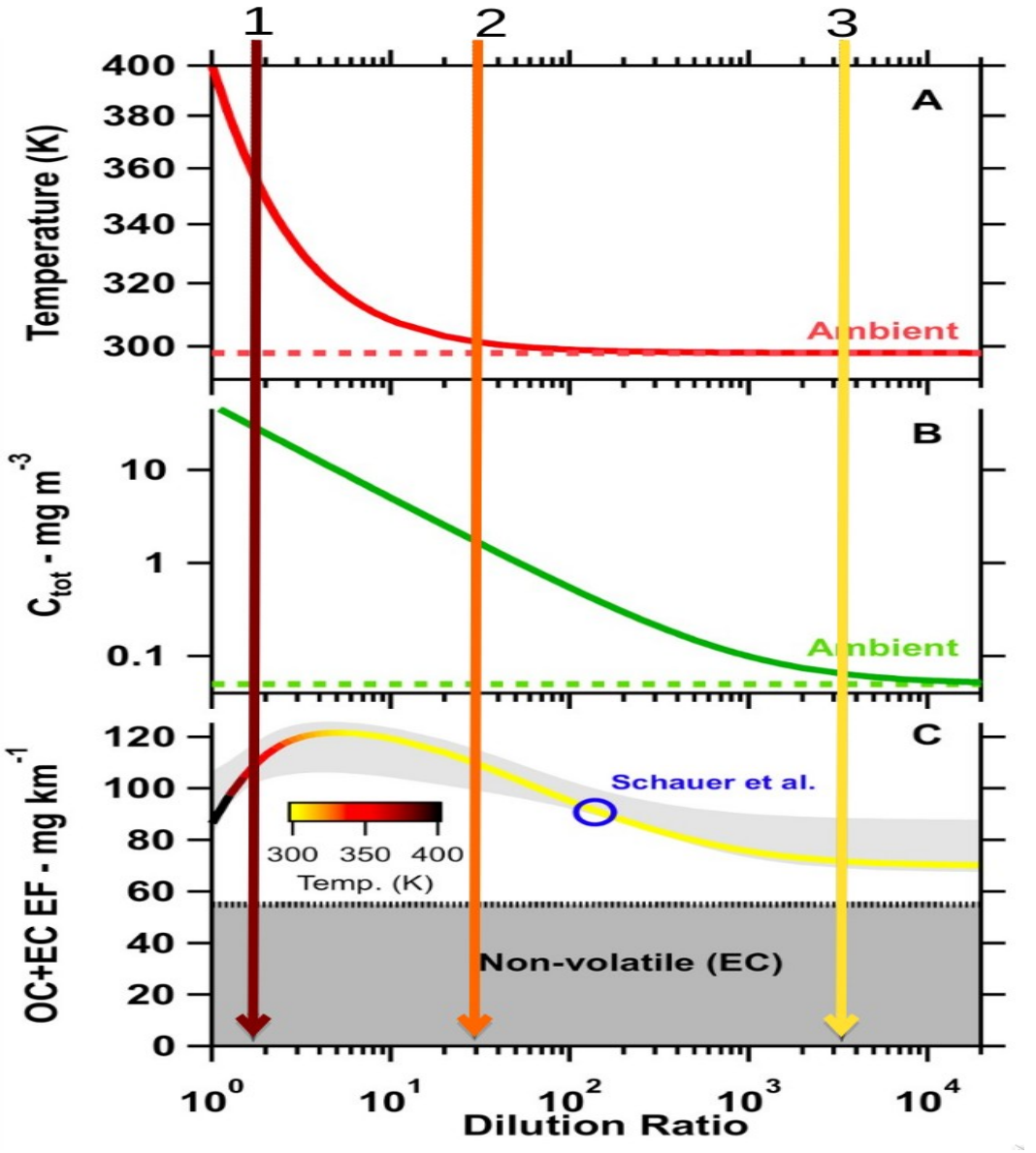
POA emissions

- Problems of OA emissions by now well known...
- SVOC – IVOC - condensables
- Europe: Denier van der Gon et al., ACP, 2015, Simpson and Denier van der Gon, EMEP 2015, Ots et al., ACP, 2016, Jiang et al, 2019
- Basically, countries report apples and oranges!



Evolution in a plume…

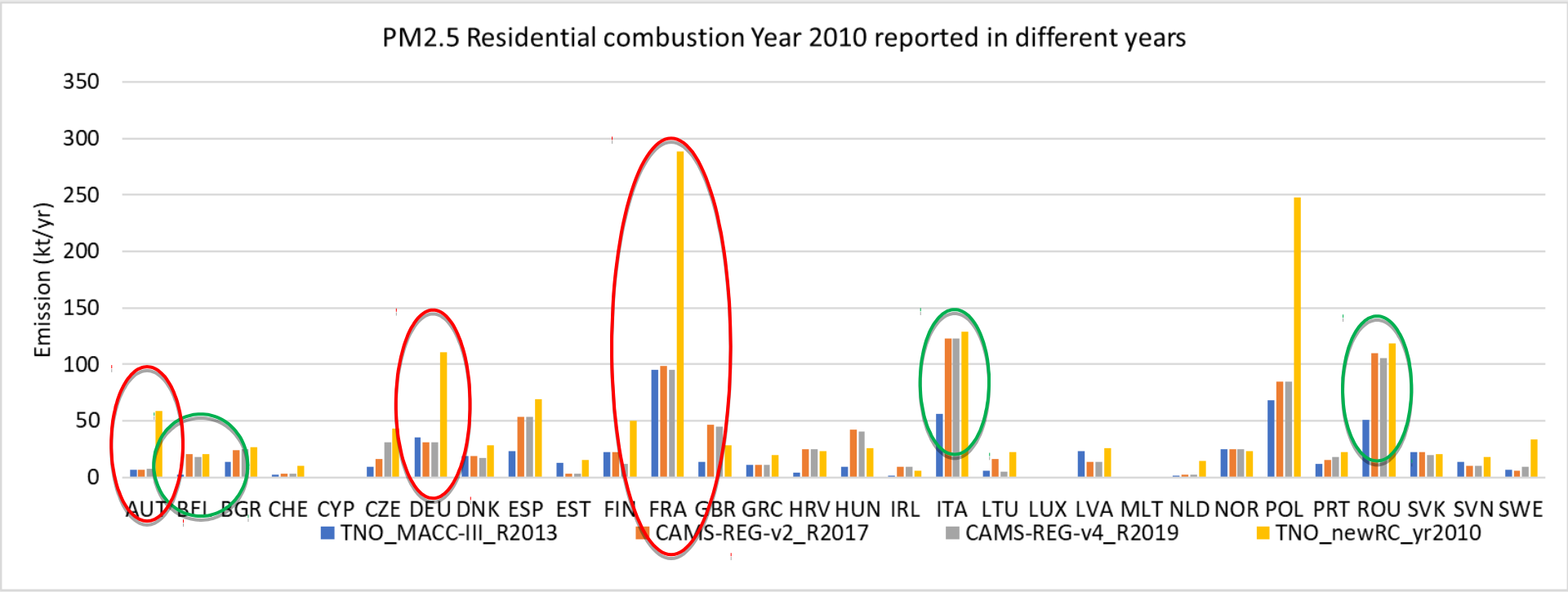




Robinson et al., 2010 JAWMA

Slide: Andy Grieshop

APPLES & ORANGES



- Comparison to a consistent bottom-up highlights inconsistencies (yellow bars)
- TNO-newRC is the same method for all, but not the “truth” – Large uncertainties!... But equal

(Blue, orange and grey bars are official emissions for 2010. Yellow bars give TNOnewRWC)

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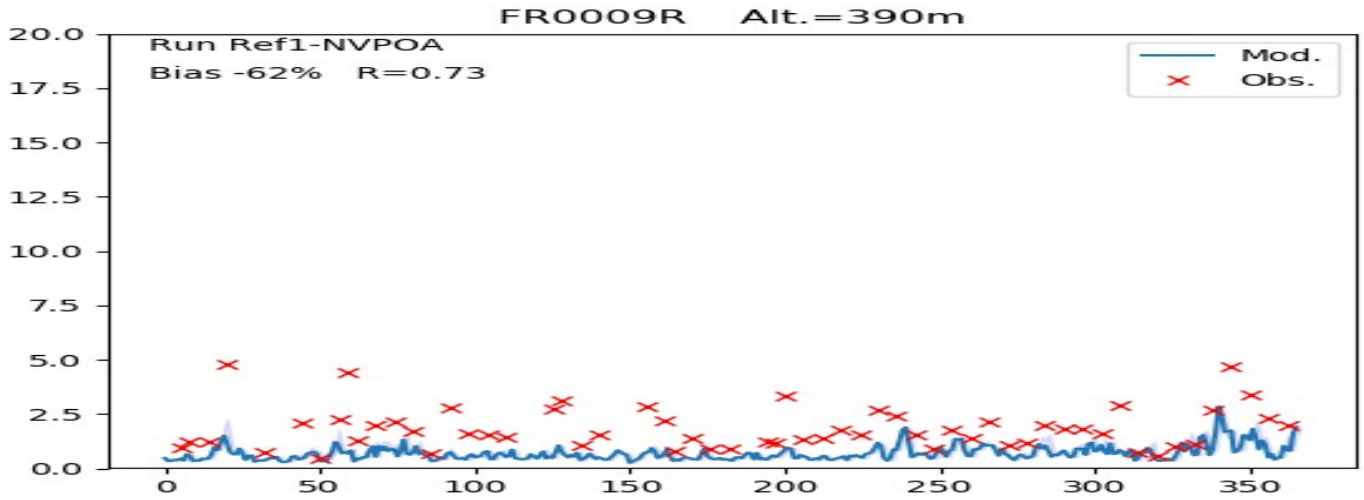
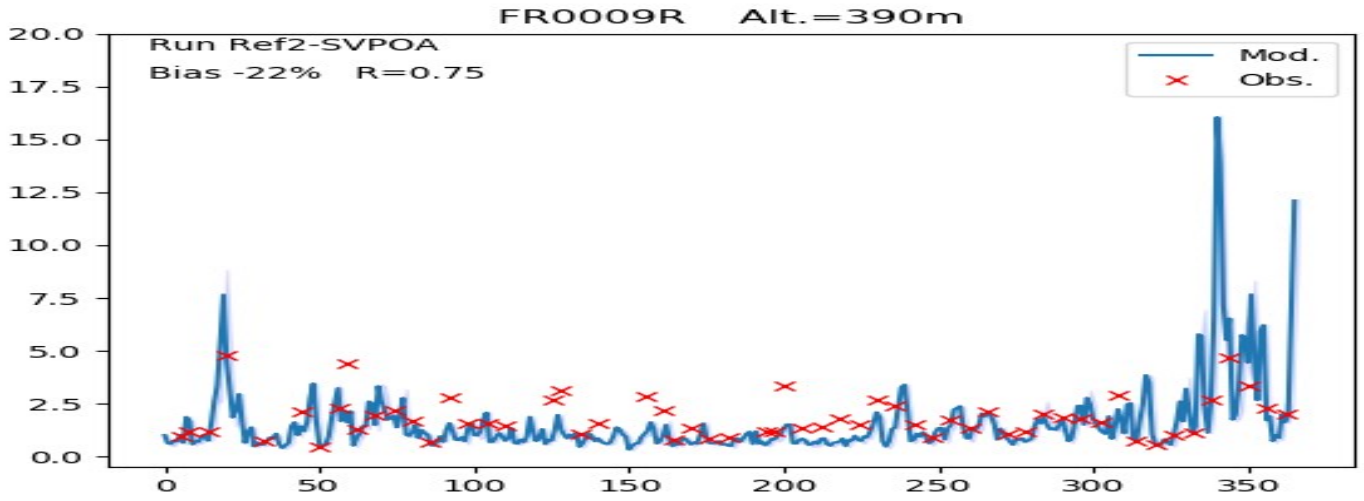
Modelling of condensables, France (FR09)

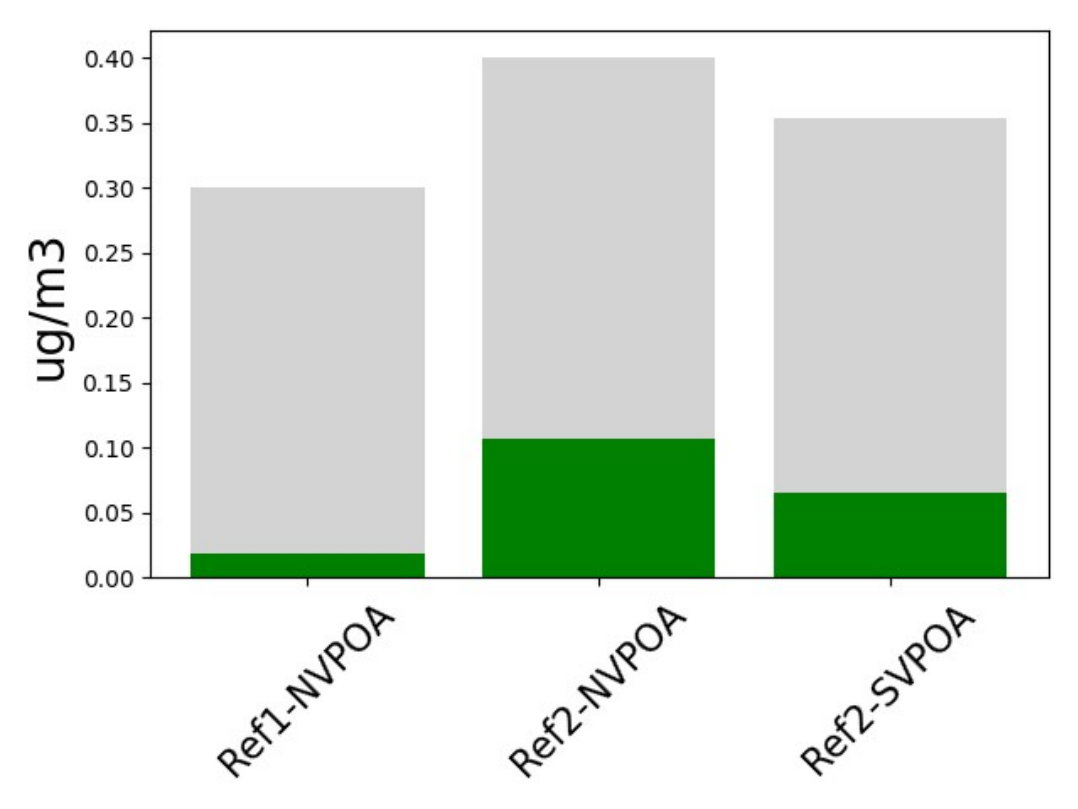
Ref1-NVPOA



Ref2-SVPOA



Condensables, impact on S-R matrices



Impact of 15% Netherlands emission reductions to $PM_{2.5}$ in own country, with runs Ref1-NVPOA, Ref2-NVPOA and Ref2-SVPOA (green = OM contribution)

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=> NMR-SVOC Workshop, March 2020

- Workshop to bring together experts in:
  - emission measurements,
  - atmospheric chemistry,
  - inventory experts, and
  - Modellers
- to systematically consider and recommend best approaches for dealing with semi-volatile emission with regard to PM2.5.
- => guidance for UN-ECE, EU

The main questions:

- **For which source categories are condensable organics important?**
- **How much condensables are produced from different:**
  - **combustion technologies?**
  - **measurement techniques?**
- **What is included in EMEP and other emission inventories?**
- **Can we specify the volatility distribution of condensables from major sources?**
- **Can we recommend a practical approach for inclusion (or exclusion) of condensables in (a) inventories, and (b) chemical transport models?**

- ~30 experts, including: Chairs EMEP, TFIAM, TFMM, TFEIP, TFTEI
  - Centres: MSC-W, CEIP, CIAM; Inventories: TNO, CIAM, COPERT
  - European Commission, CONCAWE, US EPA
  - Experts: UBA - Germany, SINTEF - Norway, IVL, ACES, Swedish EPA - Sweden, CITEPA, INERIS France, ECCC - Canada, Univ. Patras – Greece, PSI - Switzerland, INERIS - France, Univ. York - England, NC State University – USA

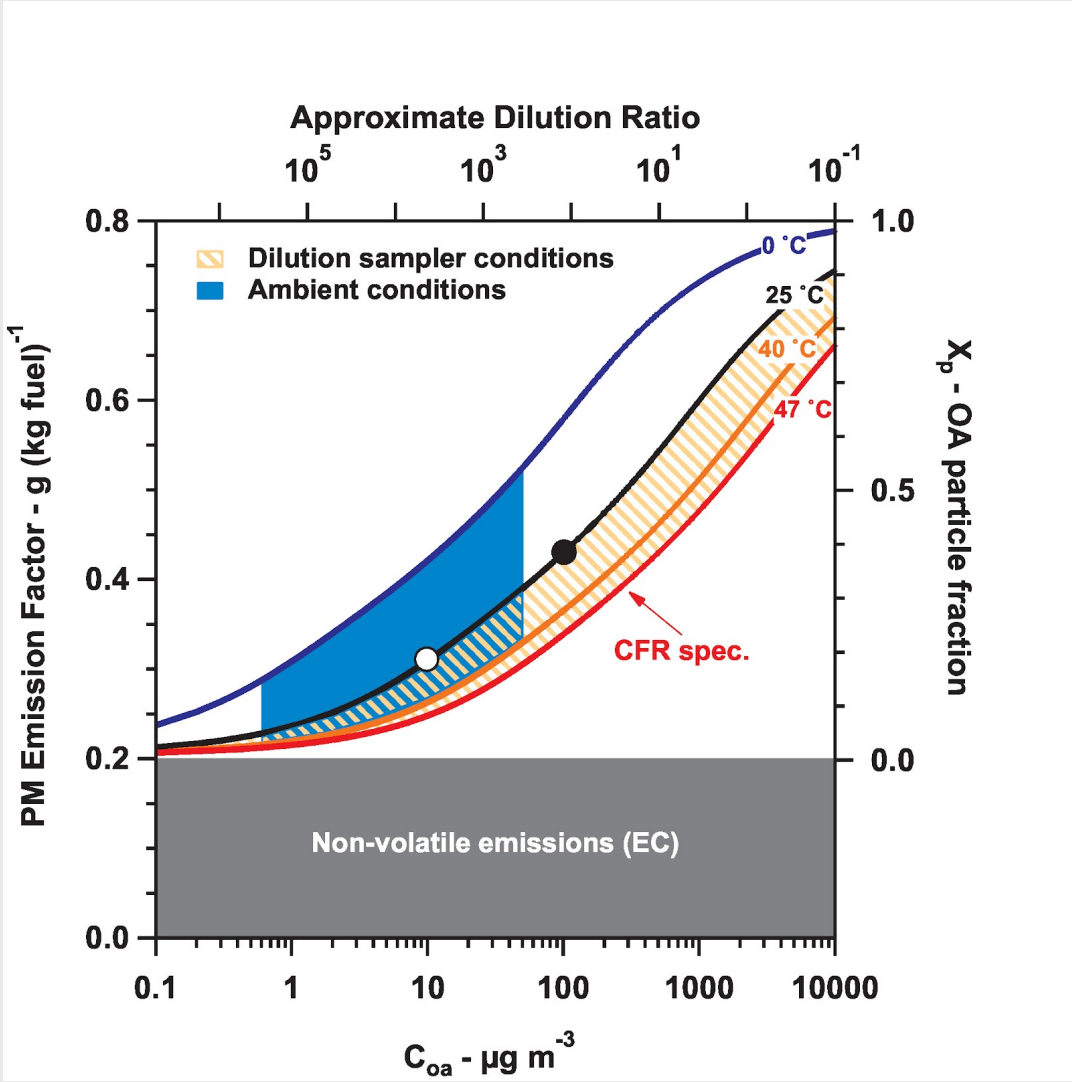
NMR Workshop Conclusions

- The current situation is untenable and unfair – a mixture of apples and oranges, in that the same activity (eg burning one unit of wood) produces very different PM emissions in national reporting.
- The workshop confirms the importance of condensables and agrees that residential wood combustion is a priority source. But it is also important to take stock of other sources that might prove to be important.
- Assumptions behind national emissions are not documented, and methods can change from year to year.
- The workshop participants agree that condensables should be included in future emission inventories and modelling.
- But it is not obvious how they should be included!

Condensables “in” or “out” - it ain’t that easy!

- Emission factors depend on:
  - source
  - measurement conditions
    - Ambient temperature
    - Ambient C_{OM}
    - Operating conditions
    - etc.!

Needs pragmatic definitions!



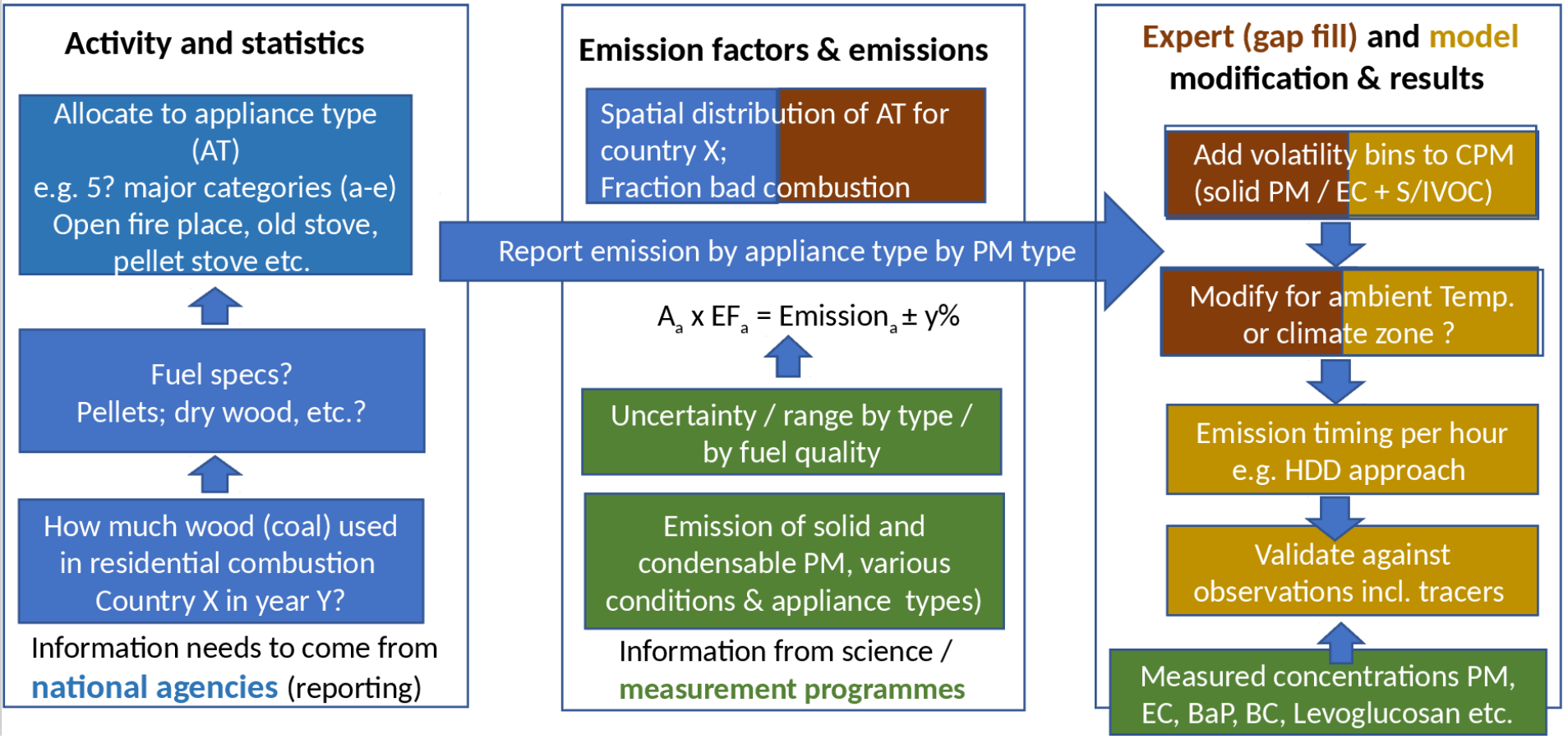
Robinson et al., 2010, JAWMA

Conclusions - short term

- The TNO REF2 emission inventory is a good first no-regret step for describing condensable emissions from residential wood combustion in emission dispersion modelling
- Ref2 needs to be further documented, and evaluated against national emission and IIASA estimates: focus on RWC in first steps.
- Identify needs for more detailed emission reporting, and communicate clearly to parties. This could for example entail requests for types of wood-stoves, or exhaust standards on road-transport
- Don’t forget IVOC (associated more with VOC than PM)

A flow chart as a way forward?

Towards Transparency (essential) and choices (who to do what?)



(slide/suggestion: Hugo Denier van der Gon)

Flow chart is cyclic – source by source; start with most prominent (RC and/or RT).

- First cycle 12 months?
- Repeat cycle when more data come in Year 2 or 3?
- “Expert role” in Year 1 can be bigger – e.g. gapfill information for the time being (e.g. TNO data set / approach); propose to countries; invite improvement through a TFEIP cycle
- This can be the basis of a road map with certain milestones when data delivery is needed (e.g. EMEP meetings etc.)
- Needs guidance and support! Making the process depend on (only) voluntary contributions leads to a new fruit basket with apples & oranges and more….
- In parallel a research programme or CSA action is needed which fuels the progress & ensures that we take up new things (e.g. from US)

slide: Hugo Denier van der Gon

Conclusions - longer term

- Many countries will need help in implementing new methods for estimating condensables.
- This help should be available through comparison with data from similar countries, with Ref2 assumptions, the Guidebook, and from participants of this workshop.
- Much data and experience is available from the US EPA, and work towards consideration of this can begin now.
- Move towards more explicit PM emission split - SO4, EC, OM25_filt, OM25_condensables?
- **Generally - prepare for more detailed emission reporting requirements - nationally and in Guidebook.**

NMR Workshop … to be continued!

- The issues are COMPLEX!
- Two days of (video) meeting are not enough!
- The group of people assembled for the workshop is extremely well placed to tackle these issues in detail
- Work will continue offline, addressing specific issues and other sources - documenting both problems and solutions
- Need for pragmatic solutions well understood
- NMR report due 1st Oct, but should be almost ready by EMEP SB

Acknowledgements

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- Nordic Council of Ministers - for meeting and follow-up work

And also:

- EMEP under UN-ECE - additional funding for Met Norway
- Participants - also for flexibility and helpful responses to corona-complications!
- Stefan Åström for organisation, teaching and running of zoom

Shame we missed Göteborg!

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