The Current Status and Future of WRF-Chem

Georg Grell, Ravan Ahmadov (NOAA/ESRL and CU Boulder)

Mary Barth, Gabriele Pfister (NCAR/ACOM)

Jerome Fast (PNNL)

No new additions for V4.1, only bug fixes..

Even lots of talk about strange new models

Is this the end?

The beginning of the end?

A look at significant success stories this year

- Acceptance for operational implementation at NCEP (RAP/HRRR Smoke) – simplest possible application of WRF-Chem

- Implementation of **WRF-Chem chemdriver** as NUOPC chemistry component into FV3 (ESMF coupling)
  - Currently only GOCART modules used (planned NGAC replacement in 2020)
  - **Other chemistry modules could easily be turned on** (eg. ECMWF like setup would also be possible)
  - Some simple WRF-Chem modules will also be implemented into CCPP (CPF? Xxx?) – and maybe also more complex modules

WRF-Chem is very successful and is widely used around the world

- Original papers have more than 2000 citations (1400 for Grell et al., 600 for Fast et al.) on Research Gate, more on Google Scholar

- Several highlighted publications, also 2017 Hagen-Smit prize for the Grell et al. paper)

- Thousands of users and by now over 600 users subscribed to the WRF-Chem discussions email list

- European WRF-Chem Workshop for last 3 years

Current developments

- Implementation of simple SOM-MOSAIC in WRF-Chem to model organic aerosol - simulates multi-generation gas-phase chemistry, kinetic gas/particle partitioning, heterogeneous chemistry, and oligomerization reactions (**CSU**)

- Updates to gas-phase and multiphase chemistry schemes for SOA and to MOSAIC-VBS SOA, i.e. more detailed biogenic SOA (**PNNL**)

- Tagged ozone mechanism from NOx and VOC sources (**Potsdam,Germany**)

- Higher frequency (e.g. hourly) fire emissions (GOES-16 FRP-based).Updates to anthropoenic emissions. Updates to RACM-MADE-VBS speciation and reactions for fire chemistry (**ESRL/CSD**)

- Updates to aerosol optical properties computation (**UCLA**)

- Changes to the WRF-Chem code and linking some external model code to the WPS program - for bioaerosols, in particular allergenic pollen and fungal spores (**UK, Manchester and Worcester**)

Currently no plans for **major** new WRF-Chem developments by NCAR

But: WRF-Chem community support, gate keeping, getting stuff back into community version…

- Support for WRF-Chem questions, errors, and development is small and getting smaller
  - NCAR/ACOM, PNNL will continue to provide support for the tools they have contributed
  - Concern about having enough support to release major additions (e.g., conduct regression tests, documentation, support)

- Major WRF-Chem Development Contributors have been NOAA/ESRL, PNNL, NCAR
  - NOAA/ESRL have been the gatekeepers (mostly unfunded), but are moving on to FV3-Chem
  - NCAR/ACOM will eventually switch to MUSICA which is part of SIMA
  - PNNL will continue to use WRF-Chem

Death sentence ....??

What will the future bring for WRF-Chem?

WRF-Chem - Other Thoughts

- For help, best practice is to make use of WRF/WRF-Chem Forum:

  http://forum.mmm.ucar.edu/phpBB3/

- At present we question availability of gatekeeper for WRF-Chem
  - Community version of chemistry is essentially frozen, unless we find someone… or funds to hire someone
- Should we be ready to switch to next generation models ? Can they do what WRF-Chem can do? Direct, indirect feedback? LES? Data assimilation?

Live forever? Be frozen? Death sentence?

Find Funding?

Need money
Please help
Will predict air quality for money