ON-LINE PROCESSES AND FEEDBACKS IMPLEMENTED IN NMMB/BSC-CTM

**NMMB/BSC-DUST: the mineral dust aerosol model**
- A new model for the mineral dust cycle fully embedded within NMMB.
- Dust aerosol is described within 8 transport bins in the range 0.1 - 10 µm and a sub-bin invariant lognormal approach.
- 4 soil population modes are involved in the parameterization.
- Several dust processes implemented, such as physically-based emissions due to sandblasting, transport, sedimentation, dry deposition, and storage below-cloud scavenging, dust convective mixing (following the adjustment approach of BMJ).
- RRTM SW/LW radiative scheme implemented and coupled with the NMMB clouds.
- Dust optical properties (optical thickness, single-scattering albedo, asymmetry factor) parameterized and coupled with the RRTM scheme (coupling allowed).

**NMMB/BSC-CTM: adding tropospheric gas-phase chemistry**
- Extending the NMMB/BSC-DUST model towards tropospheric gas-phase chemistry.
- Wide range of application from global to sub-synoptic scales.
- Modular implementation within NMMB. Chemistry solved in the NMMB was added at the same time.
- The advection, horizontal and vertical diffusion solved with the NMMB numerical schemes.
- Dust processes of NMMB/BSC-DUST included and feedback interactions allowed.
- Several gas-phase processes implemented, such as on-line natural emissions from MEGAN model (Guenther et al., 2006), transport, dry deposition, clouds scavenging and wet deposition.

**FUTURE DEVELOPMENTS**
- Improvement and upgrade of the numerics and the physics of the chemistry part of the model: gas-phase, dry deposition, cloud chemistry, aqueous-phase chemistry, linear stratostrophic chemistry, etc.
- Implementation of the other global relevant aerosol species, i.e. sea-salt (SS), black (BC) and organic carbon (OC), and sulfate (SO4) in addition to dust (DU). Several aerosol processes will be implemented in the model such as physically-based emissions, water-uptake, dry and wet removal, convective mixing, sulfur chemistry, etc.
- Evaluation tasks of the system on local and regional configurations.
- It is planned to couple the radiative scheme with all the considered aerosol species to simulate the aerosol radiative effect.
- It is planned to couple the model ozone prediction with the radiative scheme of NMMB.
- It is planned to couple the photolysis scheme with the model clouds, ozone, and aerosol species (DU, SS, BC, OC, SO4).

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