Anthropogenic dust experiment

- Objectives:
  - Estimate variability of anthropogenic dust emission, load, optical depth, and radiative fluxes,
  - Estimate model variability of velocity threshold of wind erosion (U_t) as a function of model resolution
- Models: transport/climate models with/without nudging.
- Period to simulate: 2010-2012 with spin-up
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Experiments

- Period to simulate: 2010-2012
- Experiment:
  1. Simulate with your own sources using your own C^0 and U_t^o.
  2. Simulate with MDB2 natural sources with U_t^o, then calculate global emission C^{new} to have same global mean annual emission as in 1.

     $C^{new}=C^0$ * (global mean annual emis exp1)/(global mean annual emis exp2)
  3. Simulate with MDB2 anthropogenic sources with C^{new} and with:
     1. U_t^o
     2. $0.5*U_t^o$
     3. $1.5*U_t^o$
  4. Simulate with MDB2 natural and anthropogenic sources with C^{new} and U_t^o

Notes: (1) Sources are assumed to vary between 0 and 1. No sources is assumed to have evrywhere a constant soil erodibility of 1. (2) C^0 is the global constant value used to tune dust emission to get optimal comparison with observations (e.g. concentration with surface data).(3) U_t is the threshold of either the friction velocity or 10-meter wind.

MODIS DB sources

- MODIS based source fraction, as described in Ginoux et al. (Rev. Geophys., 2012) but updated with Collection 6 2003-2015 Level-2 data, and landuse for 2005.
- Fields:
  - foo = erodible fraction
  - foo_nat = erodible fraction without landuse
  - foo_ant = erodible fraction with landuse
- Valid values: 0 to 1
- Units: none
- Resolution: annual 0.25^{o}x0.25^{o} and 1^{o}x1^{o}
- Format: netcdf

Note: *Inventory of landuse corresponds to year 2005 and is taken from HYDE 3.1, as described by Klein Goldewijk et al. (Global Ecol. Biogeogr., 2011).*

Model output

- Static:
  - Vertical coordinate system
  - Altitude above sea level
  - Land/sea mask
  - Dust size distribution: for each bins provide
    - 1) distribution function (e.g. lognormal, dM/dlnR=0, etc.),
    - 2) minimum radius (m),
    - 3) maximum radius (m),
    - 4) effective radius (m),
    - 5) density (kg/m^3)
- 2-D daily:
  - Surface pressure
  - maximum surface wind (friction and/or 10-meter),
  - mean volumetric soil moisture
  - mean Leaf Area Index (if used in dust emission)
  - for each dust size bins
    - Emission
    - Deposition (wet and dry)
    - Dust burden
    - Optical depth
    - Absorption optical depth
- 3-D daily:
  - For each dust size bins: Dust concentration

Timeline

- March-May, 2016 simulations
- June 2016: send the output files
- July-August 2016: Analysis
- September 2016: First results (Aerocom-XV)
- December 2017: First paper draft