New Features in Version 3.3

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WRF Community Model

- Version 1.0 WRF was released December 2000
- Version 2.0: May 2004 (NMM added, EM nesting released)
- Version 2.1: August 2005 (EM becomes ARW)
- Version 2.2: December 2006 (WPS released)
- Version 3.0: April 2008 (add global ARW version)
- Version 3.1: April 2009
- Version 3.2: April 2010
  - Version 3.2.1: August 2010
- Version 3.3: To be released March/April 2011

V3.2 Highlights (2010)

- Microphysics options: Milbrandt-Yau double-moment (Environment Canada)
- BEM urban option in Noah (Martilli, Salamanca, CIEMAT)
- Nonlinear Backscatter sub-grid stress model for LES (Mirocha, Kosovic, LLNL)
- WRF-Fire (Coen et al., NCAR)
- NDOWN vertical refinement (Moussaoui, Arizona State U)
- Multiple other changes (see last year's slides)

New Options in V3.3

- Stonybrook University Y. Lin (SBU_YLIN) microphysics (mp_physics=13)
  - Cloud, ice, rain, snow variables plus diagnostic riming intensity to account for snow-graupel transition
  - Provided by Y. Lin and B. Colle (SBU, New York)

New Options in V3.3

- CESM physics from NCAR CESM climate model to add to WRF-CESM physics suite
  - Zhang-McFarlane cumulus parameterization (cu_physics=7)
  - University of Washington PBL (bl_pbl_physics=9) and shallow cumulus scheme (shcu_physics=2) by Park and Bretherton
  - Code provided by W. Gustafson and J. Fast (Pacific Northwest National Lab)

New Options

- New Goddard shortwave and longwave radiation (ra_sw_physics=5, ra_lw_physics=5)
  - Updates previous Goddard shortwave (option 2) and add new longwave
  - From R. Shi (NASA Goddard)

New Options

- Total Energy Mass Flux (TEMF) PBL (bl_pbl_physics=10)
  - Uses concept of total energy instead of TKE
  - Also includes a shallow convection scheme
  - From W. Angevine (NOAA/ESRL)

New Options

- Simplified Arakawa-Schubert (SAS) scheme (cu_physics=3) made to work in ARW (previously NMM only)
- New SAS scheme (NSAS, cu_physics=14)
  - Currently operational in GFS global model
  - Provided by NCEP/EMC and S. Hong (YSU)
- Tiedtke cumulus scheme (cu_physics=6)
  - A mass-flux type scheme
  - Provided by Y. Wang (U. Hawaii)
- Note that the Zhang-McFarlane, NSAS, and Tiedtke schemes all include momentum transport terms in ARW, while SAS includes them in NMM

New Physics

- Shallow cumulus driver added (currently only one option, more in future)
- Wind farm parameterization
  - Interacts with MYNN PBL, advects TKE, provides turbine effects and power output
  - Provided by A. Fitch (U. of Bergen, Norway)