

AGU for APE

agoo! for ape!

AGU

- AFES Working Team
- GFEDennou Club
- University of Tokyo

AFES Working Team

- Mayumi K. Yoshioka (ESC)
 - Tropical depressions.
- Yoshiyuki O. Takahashi (Hokkaido U.)
 - Energy spectrum.
 - (Martian AGCM)
- Wataru Ohfuchi (ESC)
 - Chief AGU.
 - General circulation (Hadley circulation, subtropical jets...).

GFD Dennou Club

- *Yoshi-Yuki Hayashi* (Hokkaido U.)
 - Chief AGU.
 - Tropical disturbances.
- *Yukiko Yamada* (Hokkaido U.)
 - Tropical disturbances.
- *Kensuke Nakajima* (Kyushu U.)
 - Convection over all.
- Masaki Ishiwatari (Hokkaido U.)
 - Tropical disturbances.

University of Tokyo

- Hisashi Nakamura
 - Chief AGU.
 - Mid-latitude dynamics.
- Takeaki Sampe
 - Stormtrack.

Model

- AFES

- It's just a name.

- Used to be “AGCM For Earth Simulator”.

A Brief History of AFES

- 1984
 - Japan Meteorological Agency Global Spectral Model.
- 1991
 - CCSR/NIES AGCM 5
 - GFD Dennou Club AGCM 5
 - DCPAM
- 1998?
 - CCSR/NIES AGCM 5.4.02
 - K-1 Japan (M. Watanabe and M. Kimoto)
 - NJR
 - Rewritten totally from scratch with FORTRAN 90, MPI and microtasking.
 - AFES (Mainly maintained at Earth Simulator Center, JAMSTEC).
 - Now version 2.

AFES's Dynamics

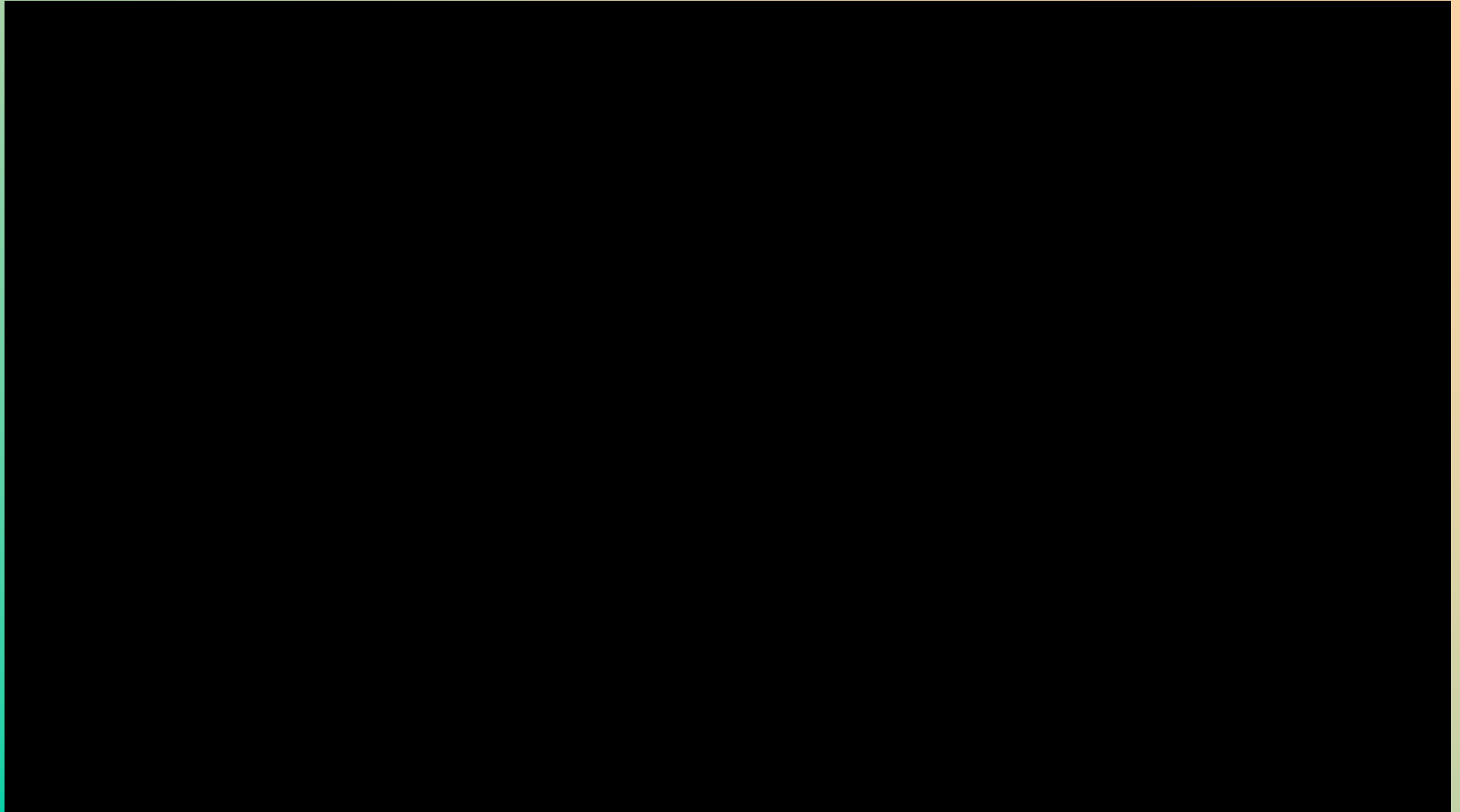
- An old-fashioned conventional AGCM.
- Primitive equation system (hydrostatic approximation).
 - Valid (arguably) down to 10 km (T1279).
- Spectral Eulerian.
- Sigma-coordinate with Lorenz grid (Arakawa and Suarez 1983).
- Leap-frog with Asselin filter and semi-implicit.

AFES's Physics Parameterizations

- Cumulus parameterizations (simplified A-S, Kuo, MCA, Emanuel, Non).
- Le Treut and Li (1990) grid condensation.
- Nakajima and Tanaka (1986) radiation.
 - Discrete ordinate method.
 - k-distribution method.
- Mellor-Yamada level 2 turbulence closure.
- Basically we do not tune parameters unless it is extremely necessary and/or it has clear physical meaning.

10-km Mesh Global Simulations

CG by NHK



Current Status of AFES

- **Not well tested for climate studies, yet.**
 - The atmospheric component of CFES. T239L48 or T159L48.
 - Akira Yoshida and Nobumasa Komori (ESC).
 - AMIP-type ensemble runs are ongoing. T239L48 or T159L48.
 - Akira Yoshida (ESC) and others.
- **High-impact weather studies.**
 - E.g. July 2004 heat wave in Tokyo with T639L48.
 - Takeshi Enomoto (ESC) and others.
- **Martian atmospheric general circulation.**
 - Y. O. Takahashi (Hokkaido U.) and others.
- **Very slow further development.**
 - Radiation (mstranX: Sekiguchi et al. 2004)
 - Surface model: MATSIRO (Takata et al. 2004)
 - Semi-Lagrangian tracer transport by Y. O. Takahashi.
 - More accurate Legendre transform by T. Enomoto.
 - Simplified surface flux computations by Y. Kurihara.
 - Stratus by A. Yoshida.
 - Etc.

Current Status of AGU for APE

- Conducted very many cases with various resolutions and cumulus convection schemes.
 - 8 SST X 5 (Emanuel, Non, Kuo+shallow convection, MCA, and simplified Arakawa-Schubert) X 6 (T39L24, T39L48, T39L96, T79L48, T159L48, T319L48) = 240.
 - T. Sampe has carried out some “more realistic SST” runs.
 - Too many cases.
 - Complicated enough.
- Current general conclusion.
 - We don't understand it.
 - We need more people to analyze the data.
 - Hopefully we can contribute to future planning of APE.
- Data files are too huge to transfer by internet. But we are happy to provide our data to the APE community.
- The APE community is rather small. We hope we can really interact with the other groups, exchange ideas and thoughts, and have some conclusions.