HYCOM 1.0

Alan J. Wallcraft

Naval Research Laboratory

3rd HYCOM Consortium Meeting

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HYCOM 1.08

- Released August 2000
  - Almost all the features from the March meeting
- MICOM-like coding style
- More ``main-stream'' than MICOM
  - MKS units throughout
  - Grid orientation is West to East then South to North
  - User-tunable model parameters are read in at run time
- Kraus-Turner or KPP mixed layer
- Thick layers are isopycnal
- Thin layers convert to Z or sigma coordinates
- For shared memory machines only
- Scalability via OpenMP (2-32 cpus)
  - Bit-for-bit multi-cpu reproducability
  - Simplified ``named pipe'' debugging capability

HYCOM 1.09

- In Beta-test (early November release)
- Minor bug fixes
- Major capability upgrade
  - MICOM-like mode
  - Energy loan ice model
  - More control of hybrid layers
  - High frequency atmospheric forcing
- Simplified OpenMP logic
  - Use ``j-loop'' subroutines when dealing with vertical processes
  - Minimizes the OpenMP changes when modifying the code
- Improved climatology interpolator
- Improved interface to plot package

HIGH FREQUENCY ATMOSPHERIC FORCING

- MICOM/HYCOM traditionally use monthly forcing
  - Read in all 12 months at start, and write them out to a direct access file

    - Always hold 4 months spanning the current time in memory
    - Interpolate across 4 months to current time
    - Climatological forcing only (Dec-Jan wrap)
- Real forcing is 12-hrly to 3-hrly
    - Modeling actual calendar years
        - Model day is days since 01/01/1901
    - Climatological forcing via 12-hrly anomalies
- HYCOM 1.0.09
    - Just in time interpolation from native to model grid (outside the model)
        - Calculate the next model run's fields while this run is in progress
    - Always hold 2 fields spanning the current time in memory
    - Interpolate these to current time

LIMITATIONS OF HYCOM 1.0

- Fortran 77 (MICOM-like) coding style
- Only for shared memory machines
- Periodic (global) regions not supported
- Nested-domain open boundaries not supported
- PAKK I/O not efficient or accurate
- All fixed in HYCOM 2.0
    - Beta-test by December 2000
    - For release in January 2001

HYCOM 2.0

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REMOVE LIMITATIONS OF HYCOM 1.0 (I)

- Fortran 77 (MICOM-like) coding style
    - Update to cleaner, Fortran 90 based, coding style
- Only for shared memory machines
    - Add MPI/SHMEM option (P-HYCOM)
    - Either MPI or OpenMP or both
        - Single source code
        - Selectable at compile time
- Periodic (global) regions not supported
    - Adding halos for MPI automatically supports periodic boundaries
    - Pan-Am grid requires a special halo exchange

- Nested-domain open boundaries not supported
  - Based on (new) archive files
  - Interpolate to target domain off-line
  - Model need only deal with one domain

REMOVE LIMITATIONS OF HYCOM 1.0 (II)

- PAKK I/O not efficient or accurate
  - netCDF is eventual target
    - Not scalable or thread-safe
    - Would limit code portability if required by HYCOM
    - How to represent Pan-Am grid?
- HYCOM 2 reads/writes ``.a and .b'' files
  - ``.a'' is a raw IEEE REAL*4 array file (Fortran direct access)
  - ``.b'' is a plain-text header file (Fortran formatted)
- This I/O is simple and portable
- It can easily be parallelized
  - Have the N-th processor read/write every N-th 2-D array record
  - Require the record length to be a multiple of 64KB?
- Convert to netCDF off-line

FILE NAMING CONVENTION

- Archive files currently contain one ``snapshot''
- Filename is `archk.XXXXXX`
  - `XXXXXX` is the 6-digit model day
  - Can't sample at less than one day
  - Confusing for real calendar day runs
    - Model day is days since 01/01/1901
- Suggested naming convention:
  - `archv_YYYY_JJJ_HH.[ab]`
  - `YYYY` is year, `JJJ` is Julian day, `HH` is hour
- Do we want multiple snapshots per file?
  - `archv_YYYY_MM.[ab]`
  - `YYYY` is year, `MM` is month
  - All snapshots for the month in one file
- Otherwise we could have one directory per year
  - `data/YYYY/archv_YYYY_JJJ_HH.[ab]`
    - Reduces the number of files per directory

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