Kitware

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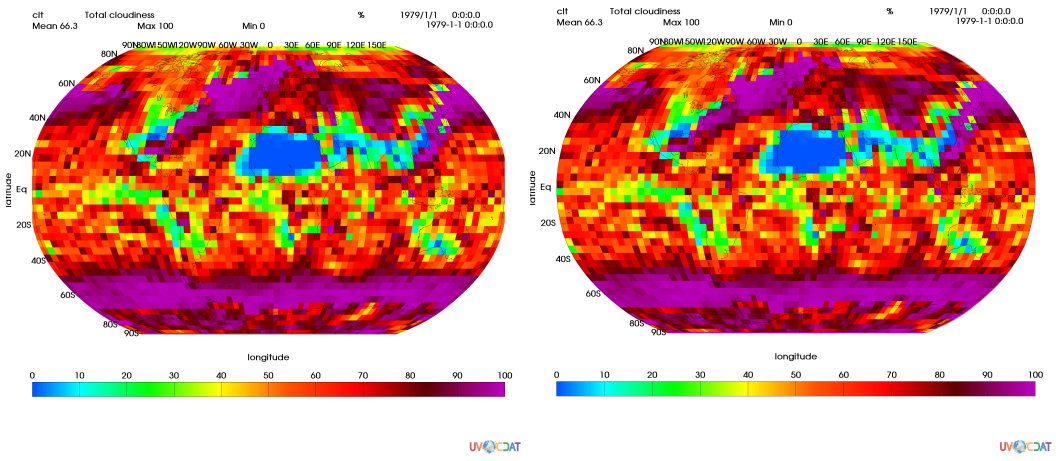
LLNS Subcontract: B614665
Quarterly Report
POP: January 1st – March 31, 2016

Bug fixes and enhancements to uvcdat

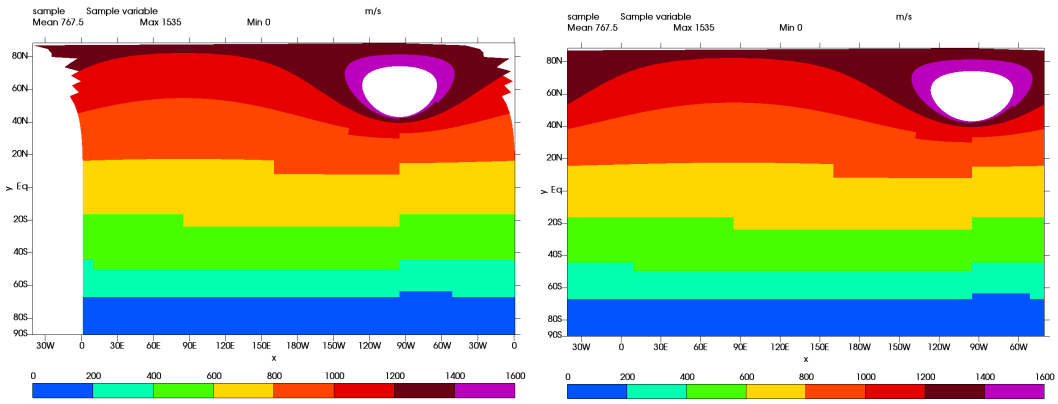
- Use dataset bounds when computing parallel projection for plots instead of recomputing these bounds using a 2D array of plots. This fixed long standing alignment issues for plots that use geographic projections. With this change, we improved images for 63 tests similarly with the images included at the end of this paragraph.
    - BUG #1739: fitToViewport uses dataset bounds instead of recomputing them fitToViewport recomputes the dataset bounds using an 2D array of points. This is slow and imprecise and it does not take into account the bounds stored in the file. Now we use a new function fitToViewportBounds that receives the dataset bounds as parameter. The old function is still used for the outline and the continents. It is going to be removed in the future.
    - BUG: use fitToViewportBounds for outline and continents.



Boxfill plot with robinson projection. Images before (left) and after (right) our fix. We improved images for 63 tests in a similar fashion.

- Wrapped meshfill grids. This enhancement improved plots for curvilinear grids that are cut along irregular lines.

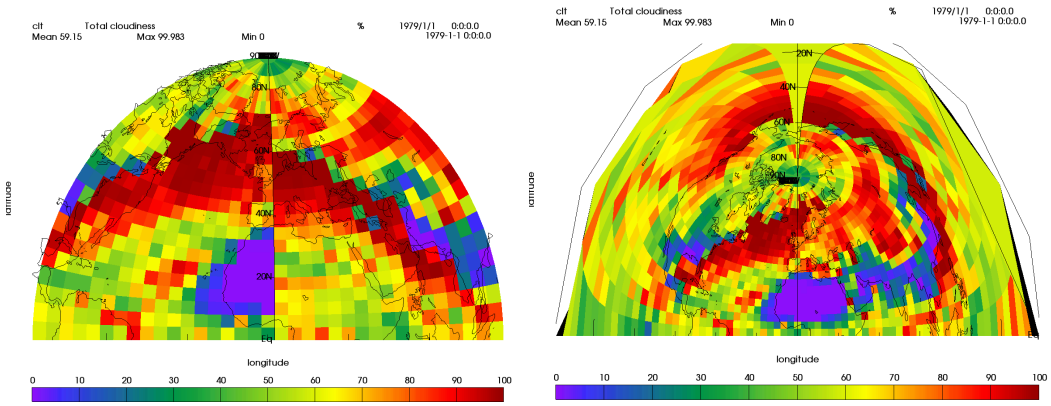
- ENH #1754: irregular cuts are not wrapped.
  sampleCurveGrid4.nc data is cut along an irregular line (not along a longitude line). This causes lon data to vary between -40 and 361. We wrap this data to the -40,320 interval. In general we wrap data to the interval minX,minX+360 where minX is the minimum longitude value. This fix improved images for 36 tests similarly with the images included in this paragraph.



Meshfill with linear projection. Images before (left) and after (right) our change. We improved images for 36 tests in a similar fashion.

- Update uvcdat to use latest VTK and proj4.9.2. This improved plots using aeqd projection and fixed system dependent bugs for certain projections. This change improved images for 53 tests for AEQD projection similarly with the images at the end of this paragraph. Note, that these plots require more work to add more points for outlines and better place labels.
  - Update script for ThirdPary/libproj4
    Changes to proj4 are stored at
    https://gitlab.kitware.com/third-party/proj.git in for/vtk branch.
    The update script is run to move those changes into
    ThirdParty/libproj4/vtklibproj4
  - Remove all proj4 files to start fresh.
    proj4 is updated from a very old source for which there is no repo online. We remove all files to start fresh on a recent proj4.
  - Fix Geovis tests. Projections numbers changed in proj 4.9.2
    We used a very old proj (4.3.2 from 2008?). Since then
    projection indexes have changed. Projection indexes are used
    to select the projection for vtkGeoProjectionSource.
    So, while it is possible to convert between a projection index to a projection name, the projection index might change for future versions of proj4.
  - Enable vcs_test_lambert on Mac Os X.

- GL2PS uses a different class and module.



Boxfill with AEQD projection. Images before (lef) and after (right) our upgrade. More work is required to smooth outlines and better place labels. We improved images for 53 tests in a similar fashion.

- Fixed in VTK, system dependent crash and mangled image for the lambert projection.
  - BUG: push_back may cause pointers to become invalid
    Pointers to strings stored in a vector are kept, however new strings are added using push_back which causes the pointers to become invalid. This behavior was only seen on mac os as the vector was small so reallocation did not happen on other platforms.
  - BUG #1777: lambert test creates mangled up image
    vtkGeoProjection initialized a new projection for every GetProjection call. This created a lot of allocations/deletes which probably exposed memory problems in proj4.
- Fixed plot resize issue with cdat-web
  - BUG cdat-web #78: VTKPlots.configureEvent is not called
    A handler for ModifiedEvent is added to the interactor which is replaced by vtkWeb. A new handler is added on render window.
- Miscellaneous bug fixes and enhancements:
  - BUG: proj4 over option causes problems with polar projections
    On certain machines, +over option to proj4 results in wrong projections. It is not clear why there is a difference between different computers - we have seen this behavior on both unix and mac. +over does not wrap points outside of -180, 180. To fix those machines we remove the option for polar projections.
  - Refactor computation for the bounds of an axis.
  - BUG: Set wrong lat_0 for -3 polar (non gctp) projection. Fail to recognize that ym,yM are not the min/max for axis Y, but just the bounds for this axis.

    - Rename xm, xM, ym, yM to x1, x2, y1, y2 for project. Those are margins for increasing or decreasing sequences not bounds. So m is not less than M as suggested by the previous notation.
    - BUG #1812: Fix taylor cutoff. The generated data file was missing the top and right side because loops using right open interval were used to generate data: [v1, v2)
    - Add test for BUG # 1728: wrapping data creates long cells.
    - BUG #1849: Re-enable datawc for linear projection. For datasets using a geographic projection, datawc is only used to specify wrapping (translation of the origin, for instance from 0:360 to -180:180) and flipping.
    - BUG: calling render() from ModifiedEvent causes GetSize() to return previous size. This causes test_vcs_configurator_resize to fail.

Continuous integration and testing system

- Add build slaves to listen to merge requests on https://gitlab.kitware.com/UV-CDAT/uvcdat
- Port existing git robot to work with with Github and buildbot
- The git robot would listen to changes, pull requests, etc. on Github and trigger test builds as needed
- Add support for buildslaves at LLNL and Kitware

Work planned for third quarter (April 1st – June 30th, 2016)

- Plot visualizations
    - Continue to fix mesh fill plot related bugs
    - Fix label size and placements
    - Discuss, design and implement interactivity on 2D plots.
    - Verify the large size issue on plot export still exists, if yes fix it.
    - Carefully analyze the vcs API, work with LLNL to fix it
    - Create documentation for vcs / uvcdat
- Infrastructure
    - Continue to improve testing
    - Get the bulidbot / gitbot up and running for github repository
    - Help with UV-CDAT 2.6 release
    - Help with conda recipes when needed