Enhancing Scientific Reproducibility and Software Correctness in CrocoDash for Regional Ocean Modeling

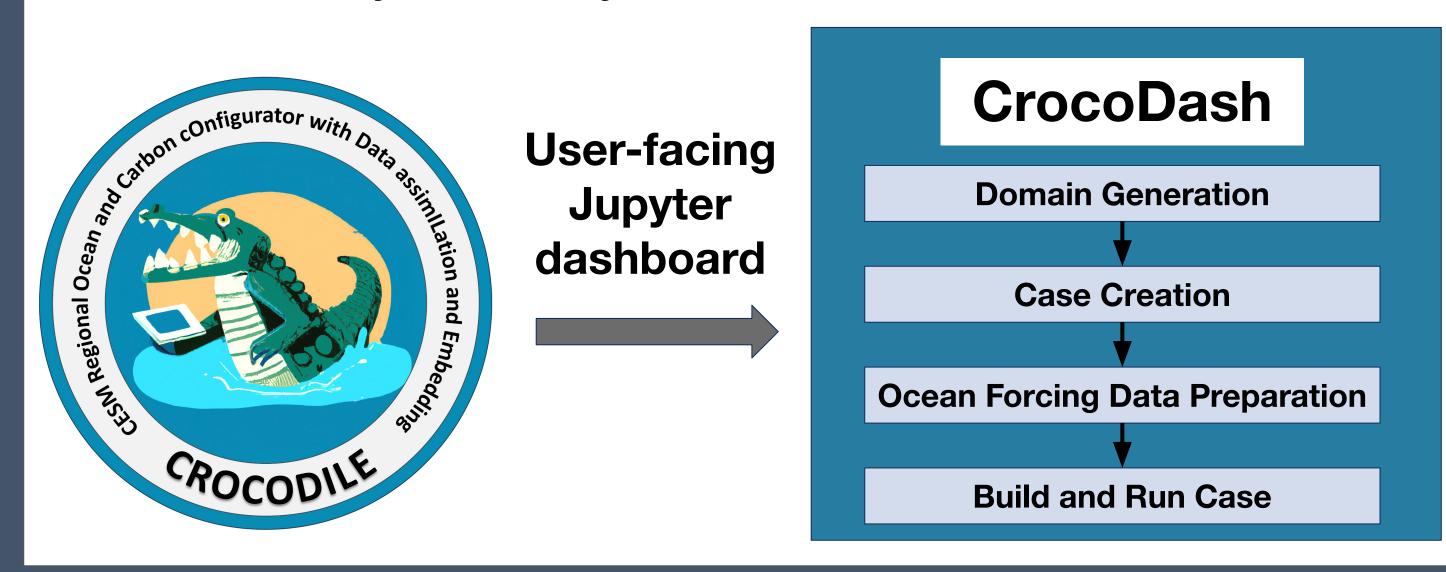
SIParCS SIParCS Operated by UCAR

Andrew Kwong, Manish Venumuddula, Alper Altuntas, Dan Amrhein



BACKGROUND

- Regional ocean models provide powerful tools for studying the impacts of climate change at finer spatial scales. They can offer insights into processes that are often unresolved in global climate models.
- These models can require large technical overhead.
- CrocoDash is a Python package that streamlines this process for rapid model prototyping of regional Modular Ocean Model version 6 cases in the Community Earth System Model.



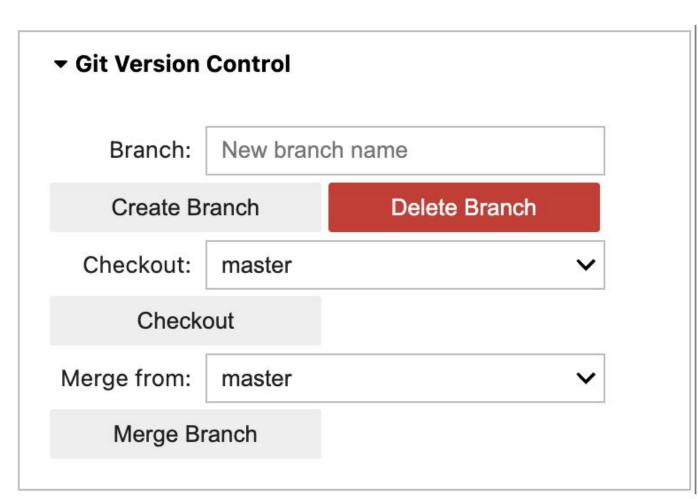
OBJECTIVE

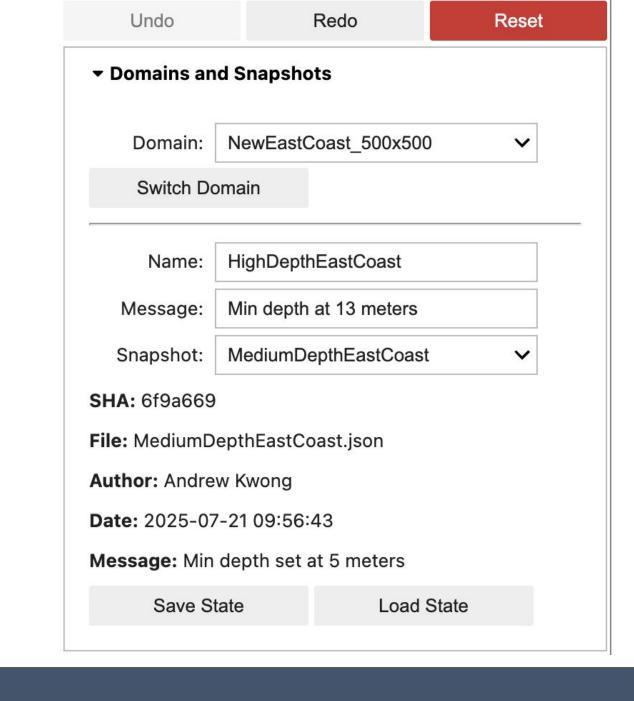
This project enhances the CrocoDash workflow to support scientifically **reproducible** configurations of regional ocean models, increasing accessibility for users and promoting open, collaborative science.

METHODS

Edit History

- History and Provenance
- Git Version Control
- Structure and Shareability





RESULTS **GRID CREATOR** Interactive tool to create horizontal grids **Topo Editor** Double click on a cell to change its depth TOPO Min depth (m): 0 **EDITOR** Interactive tool to customize Erase Selected Basir topography Domains and Snapshot Use the sliders to adjust vertical grid parameter **VGRID CREATOR** Interactive tool Name: Virginia60Levels Message: Ratio set at 2.76 to create VGrids: Virginia60Levels vertical grids **Generate Grid** Workflow Diagram **Grid Creator Generate VGrid Generate Topo Topo Editor VGrid Creator** Topo

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CASE **ASSEMBLER** Assemble cases from history, not scratch **Select Domain Objects** Horizontal Grid 2. Topography 3. Vertical Grid [8] ocean_vgrid_NewEastCoast_3e30b9.nc -- From case 'Virginia' (history idx 5) Select Case for Forcing Config Select Forcing Configuration Initial conditions, roduct_name": "GLORYS", open boundary conditions, and tides OBC NUMBER OF SEGMENTS = 4 OBC_COMPUTED_VORTICITY = True OBC_COMPUTED_STRAIN = True OBC ZERO BIHARMONIC = True OBC TRACER RESERVOIR LENGTH SCALE OUT = 3.0E+6 Create and BC_TRACER_RESERVOIR_LENGTH_SCALE_IN = 3000.0 BRUSHCUTTER_MODE = True OBC_TIDE_N_CONSTITUENTS = 0 OBC TIDE CONSTITUENTS = " **Assemble Case** OBC_SEGMENT_001 = "J=0,I=0:N,FLATHER,ORLANSKI,NUDGED,ORLANSKI_TAN,NUDGED_TAN" C_SEGMENT_001_VELOCITY_NUDGING_TIMESCALES = 0.3, 360.0 BC SEGMENT 001 DATA = "U=file:forcing obc segment 001.nc(u),V=file:forcing obc segment 001.nc(v),SSH=file:forcing obc segment 001.nc(eta),TEMP=file:forci BC SEGMENT 002 = "J=N.I=N:0.FLATHER.ORLANSKI.NUDGED.ORLANSKI TAN.NUDGED TAN" DBC SEGMENT 002 VELOCITY NUDGING TIMESCALES = 0.3. 360.0 DBC_SEGMENT_002_DATA = "U=file:forcing_obc_segment_002.nc(u),V=file:forcing_obc_segment_002.nc(v),SSH=file:forcing_obc_segment_002.nc(eta),TEMP=file:forci C SEGMENT_003 = "I=0,J=N:0,FLATHER,ORLANSKI,NUDGED,ORLANSKI_TAN,NUDGED_TAN" DBC_SEGMENT_003_VELOCITY_NUDGING_TIMESCALES = 0.3, 360.0 OBC_SEGMENT_003_DATA = "U=file:forcing_obc_segment_003.nc(u),V=file:forcing_obc_segment_003.nc(v),SSH=file:forcing_obc_segment_003.nc(eta),TEMP=file:forcing_obc_segment_003.nc(v),SSH=file:forcing_obc_segment_003.nc(eta),TEMP=file:forcing_obc_segment_003.nc(v),SSH=file:forcing_obc_segment_003.nc(eta),TEMP=file:forcing_obc_segment_003.nc(v),SSH=file:forcing_obc_segment_003.nc(eta),TEMP=file:forcing_obc_segment_003.nc(v),SSH=file:forcing_obc_segment_003.nc(eta),TEMP=file:forcing_obc_segment_003.nc(v),SSH=file:forcing_obc_segment_003.nc(eta),TEMP=file:forcing_obc_segment_003.nc(v),SSH=file:forcing_obc_segment_003.nc(eta),TEMP=file:forcing_obc_segment_003.nc(v),SSH=file:forcing_obc_segment_003.nc(eta),TEMP=file:forcing_obc_segment_003.nc(e BC SEGMENT 004 = "I=N.J=0:N.FLATHER.ORLANSKI.NUDGED.ORLANSKI TAN.NUDGED TAN" DBC_SEGMENT_004_DATA = "U=file:forcing_obc_segment_004.nc(u),V=file:forcing_obc_segment_004.nc(v),SSH=file:forcing_obc_segment_004.nc(eta),TEMP=file:forci Case is ready to be built: /glade/u/home/akwong/croc cases/VirginiaLowRu

CONCLUSIONS

- Our new features provide the foundation for rapid, reproducible Earth system modeling.
- Future work will involve documentation and testing, as well as adding features to handle for other edits and workflows performed in CrocoDash.