Exploring the impact of volcanic explosion seasonality, location, and magnitude on Arctic sea ice

Aug 2018 NCAR, Boulder, CO

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Photo courtesy of zmescience.com

Motivation

- explosive volcanism represents largest preindustrial external climate forcing in CESM-LME
- magnitude of forcing based on inferences from ice core sulfate
 - eruption location (NH/SH)?
 - eruption timing (season)?
- known global temperature response (decay ~1-10 yrs)
 - what about (~nonlinear + longterm) feedbacks in highlatitude regions (most seasonal)?



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- systematically explore Arctic sea-ice response to season, latitude
- reproduce Tambora eruption of 1815



Mid-lat (Limpari, Italy, 1229)

Tropics (Tambora, Indonesia, 1815)

Table of Model Runs

- Component Set: B1850*
 - Active atm, land, sea ice, and ocean components.
 - Non-evolving land ice.
- Grid: f09_g17_gl4
- 100 year simulations
 - 10 years (output: daily (sea ice) + weekly (other))
 - 90 years (output: weekly (sea ice) + monthly (other))
- 3 ensembles for each simulation

*1850_CAM60%WCTS_CLM50%BGC-CROP_CICE_POP2%ECO_MOSART_CISM2%NOEVOLVE_WW3

Model Runs: Plan

Run Number (not including ensemble members)	Month	Location of Volcanic Pulse
1	CONTROL	
2	January	Tropics
3	January	Midlatitudes
4	January	Arctic
5	April	Tropics
6	April	Midlatitudes
7	April	Arctic
8	July	Tropics
9	July	Midlatitudes
10	July	Arctic
11	October	Tropics
12	October	Midlatitudes
13	October	Arctic

Configuration	Resolution	Number runs	Year/run	Cheyenne core- hours/simula ted year	Total core hours (x1000)	Total data volume (TB)
B1850	f09_g17_gl4	36	10	4200	1600	4.7/4*
B1850	f09_g17_gl4	36	90	3000	10000	10/8*
TOTAL					11.600	14.7/12* *=using compression

Cost per year

Origin	Amount (M core hours)	Total
3 graduate students	0.2	0.6
CVCWG	0.5	0.5
PCWG	0.8	0.8
CISL	4.0	4.0
TOTAL		5.9

Data archive

- HPSS for 12TB
- (Or 4 hard drives we buy at the store.)

Extra slides



Monthly File Sizes and Necessary Storage Resources

	CLM	CAM	CICE	MOSART	OCN	GLC (yearly)
Individual File Size (all but glc=monthly)	246 MB	933 MB	42 MB	9.9 MB	75 MB	12 MB
100 years*12 months storage	295.2 GB	1.12 TB	50.4 GB	11.88 GB	90 GB	14.4 GB
Total Storage for 60 runs	17.71 TB	67.18 TB	3.0 TB	712.8 GB	5.4 TB	864 GB

Total Estimated Storage==94.87 TB (~100 TB)