

# MADmap Cosmic Microwave Background Analysis Software Scales

**Objective:** Analyze the Planck Cosmic Microwave Background (CMB) satellite data. Planck will scan the entire sky for 2.5 years.

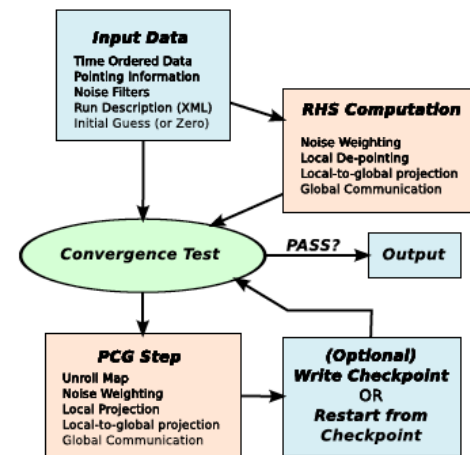
**Implications:** CMB is the most valuable resource for understanding fundamental physics and the origins of the universe.

**Accomplishments:** MADmap software developed and extensively tested against simulated time-ordered data that include realistic instrument systematics.

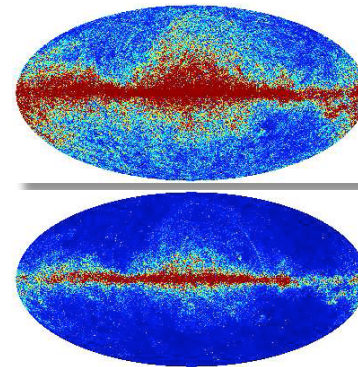
- Scales to  $\sim 10^{11}$  time samples,  $\sim 10^8$  pixels and  $\sim 10^4$  processor cores
- NASA Public Service Award in 2010

**NERSC:** CMB-NERSC collaboration dates to  $\sim 1997$ , involves extensive I/O improvement and benchmarking, lately Franklin/NGF/DVS tuning; also, extensive use of 256-core Planck Cluster; NGF is a key resource – allows production on Franklin/Hopper, analysis on Planck.

**Cantaloupo, Borrill, Jaffe, Kisner, Stompor, others**



Graphical overview of the mapping process. Blue boxes represent data products, pink boxes represent computational procedures, and RHS is the “right hand side” calculation.



Two polarization vector maps made from simulated time-ordered data