



# Extending CCMC Capabilities via NAS

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# High-End Computing Capability (HECC) Project @ NAS



## *NASA's Premier Supercomputer Center*

*Resources have broad mission impact across all of NASA's Missions  
Over 500 science & engineering projects with more than 1,500 users*

### Computing Systems

- **Pleiades** (distributed memory cluster) – 7.25 PF peak
  - 245,048 cores, 11,472 nodes
  - #17 on TOP500 (#7 in US)
- **Electra** (distributed memory cluster) – 4.78 PF peak
  - 78,336 cores, 2,304 nodes
  - Modularized container-based approach
- **Endeavour** (shared memory nodes) – 32 TF peak
  - 2 SGI UV 2000 Sandy Bridge based nodes (1024 cores with 4 TB;  
512 cores with 2 TB),



### Visualization Cluster:

- 245 million pixels; 128 screens 128 GPB-based nodes

### Storage – Global File Systems

- 7 Lustre File systems: 39 PB
- 6 NFS File systems: 1.5 PB
- Archive tape system capacity: 1 EB

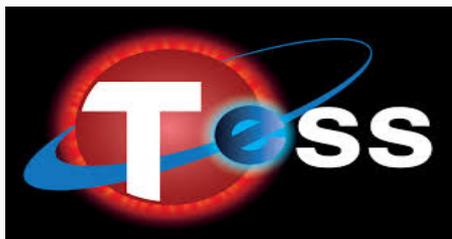
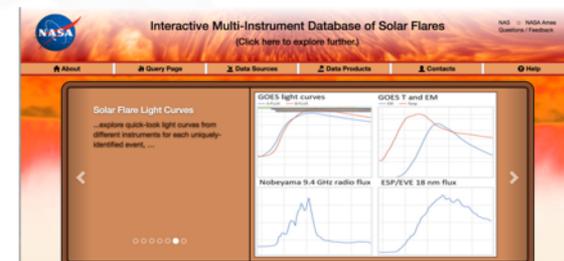


# Non-HECC Systems Supported @ NAS

- **NASA Earth eXchange (NEX):** a collaborative environment to explore/analyze Earth science data
  - Portal; 96-core sandbox for model execution; 720-core HPC;
  - 2.7 PBs storage to be extended to 4.3 PBs



- **Mission Assurance System (MAS) Platform** contains safety related documents and data for risk assessment unanticipated ISS events
  - 86 servers (including 55 VMs)
  - Failover services at LaRC, soon to be at KSC for high availability
- **Solar Flares Data Portal:** Interactive Multi-Instrument Database of Solar Flares
  - Flares lists: *GOES, HEK register, RHESSI, ...*
  - <http://heliportal.nas.nasa.gov>
  - Talk Friday 2 pm by V. Sadykov



- **Transiting Exoplanet Survey Satellite (TESS):** to discover exoplanets in orbit around stars
  - Multiple compute and database servers; 700 TBs storage to be increased to 2.3 PBs

# CCMC Requirements



- Agile hardware/software infrastructure to meet CCMC needs
  - Parallel systems supporting model runs up to 200-300 cores
  - Data storage for RoR and iSWA archive
  - Instant visualization for simulation analysis
  - Multiple web servers hosting CCMC web based tools/systems that require high availability
- However, demand for computational runs is growing
- Examples of upcoming computations that require 800+ cores:
  - SWMF AWSom
  - C-SWEPA (CORHEL+EPREM)
  - High resolution global MHD, Hall MHD, MHD with kinetic effects
  - PIC codes
- Particle outputs from PIC codes require a lot more storage than currently available



# Benefits of CCMC-NAS Collaboration

- Leverage NAS expertise and efficiencies in providing high-end computing services (both performance and cost)
- Enable community access to cutting-edge large-scale simulation resources with reasonable turn-around times
- Advance innovative Heliophysics and Space Weather research