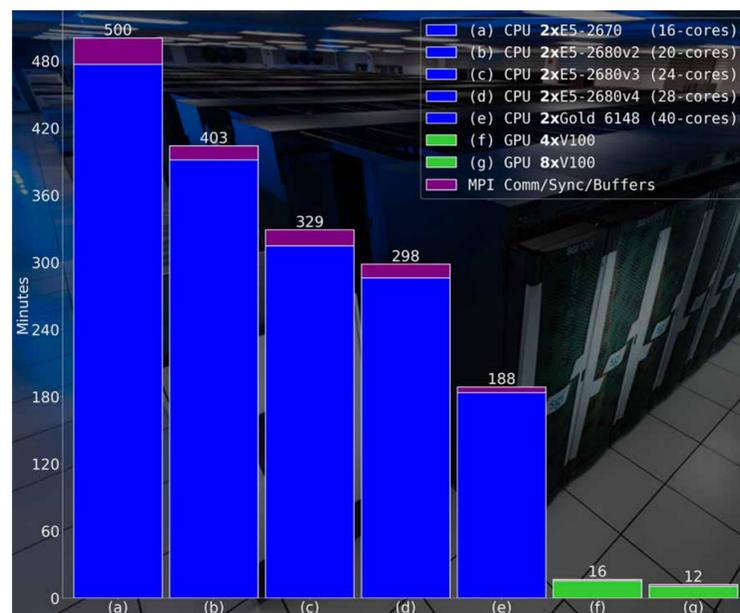


OpenACC is an application programming interface that allows the addition of GPU acceleration to legacy codes through the insertion of special code comments. We have used OpenACC to port selected models of the CORona-HELiosphere software suite to GPUs. Magnetic field lines are taken from a snapshot of a simplified solar eruption simulation.  
*Ronald Caplan, Jon Linker, Predictive Science Inc.*



Total wall-clock times for a simplified solar eruption simulation (in double precision) using the CORona-HELiosphere software suite. Timings are shown using a single CPU node on NASA's Pleiades or Electra supercomputers, for five generations of processors, and for the recently deployed NVIDIA V100 GPU nodes. The advantages of using GPUs is clear, with a single 8xV100 GPU node running the simulation over 15 times faster than a 40-core CPU node.  
*Ronald Caplan, Jon Linker, Predictive Science Inc.*

## Teaching Your Legacy Code New (GPU) Tricks

Accelerated computing using GPUs has become an industry standard for high-performance, energy-efficient computing. However, adapting the technology is challenging, especially for large, long-developed legacy codes maintained by domain scientists.

The OpenACC parallel programming model allows GPU acceleration through the use of special code comments. This greatly eases the porting process and produces a single source code, able to run on both CPUs and GPUs.

We have implemented OpenACC in our CORona-HELiosphere software suite used for solar wind and solar eruption simulations. Timing results using the NVIDIA V100 GPU nodes on the Pleiades supercomputer show very good performance, demonstrating the potential of using OpenACC to port other applications used at NASA.



*Ronald M. Caplan, Jon A. Linker, Predictive Science Inc.*