Ultra-high energy air shower simulation without thinning in CORSIKA

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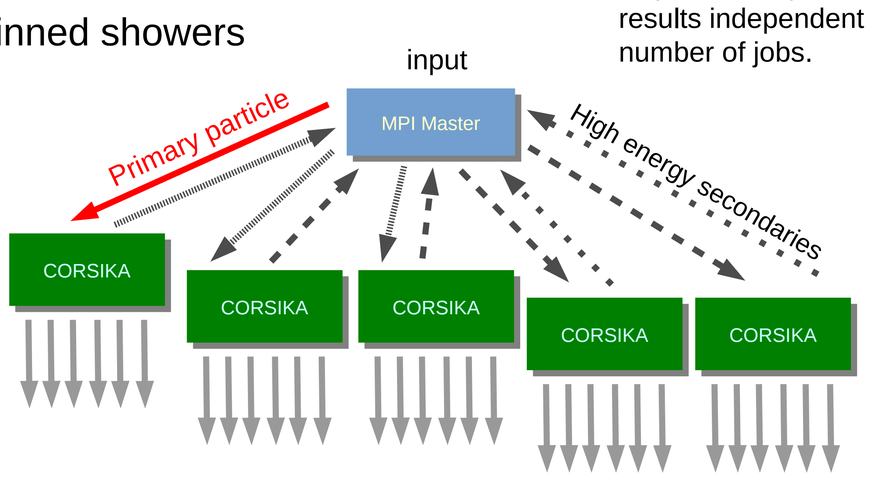
PARALLEL

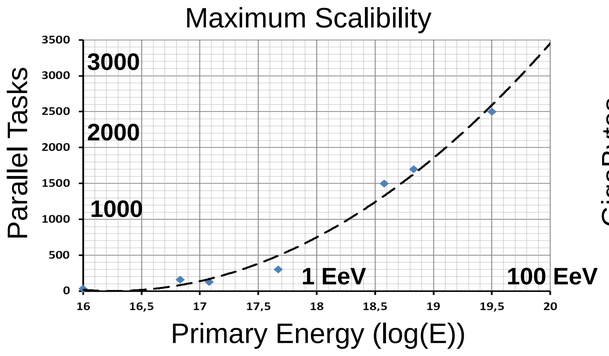
- Parallel calculation using MPI, unthinned showers

Reproducibility of the shower : results independent of the number of jobs.

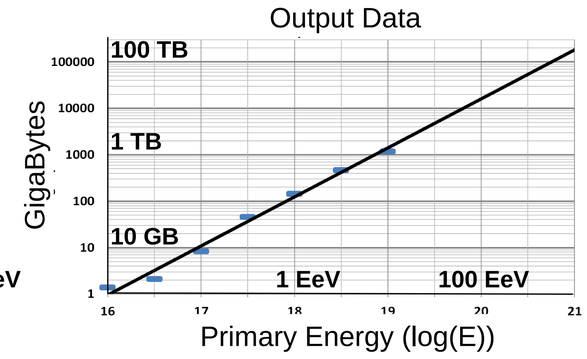


Low energy secondaries down to observation level

Maximum Scalibility



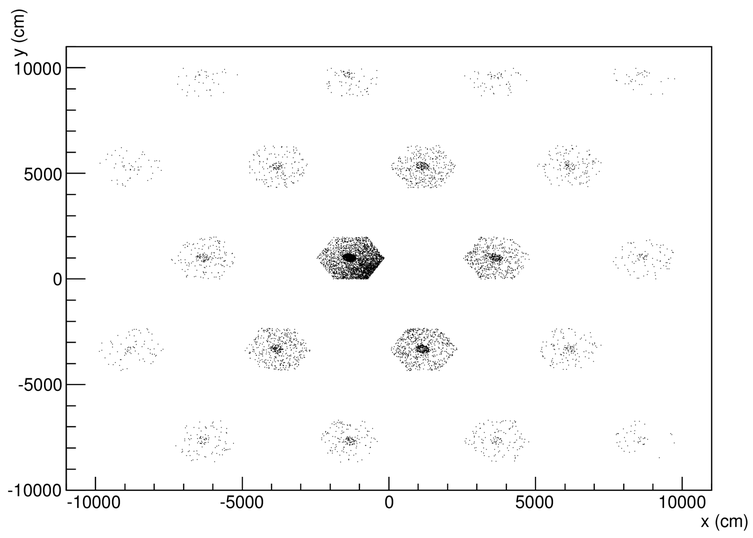
Output Data



Parallel version tested on HP XC3000 (2.53 GHz CPUs, InfiniBand 4X QDR)

AUGERHIT

- File size problem for unthinned shower
  - CORECUT to discard particles around core
  - AUGERHIT with tank shadow to save only useful particles

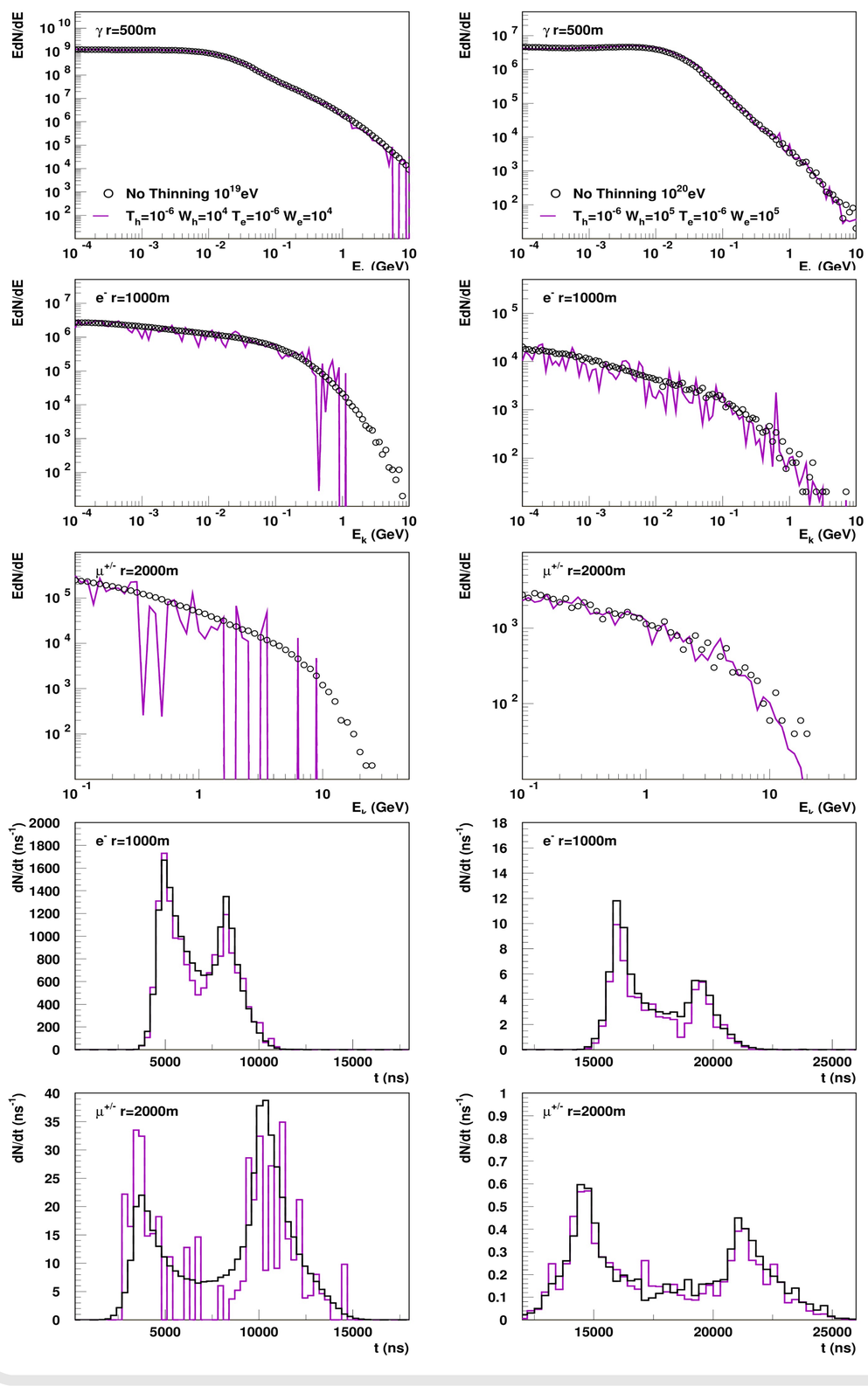


MULTITHIN

- Unthinned shower with additional weight information for various thinning levels, comparison of thinning effect event-by-event

10^{19} eV CORECUT output (670 GB)

10^{20} eV AUGERHIT output (1.7 GB)



SUMMARY

- Parallelization of CORSIKA: non-thinned shower analysis for small scale substructures and fluctuations
- New options for ultra-high energy unthinned showers
  - AUGERHIT and CORECUT to reduce output file size by factor ~1000
  - MULTITHIN to analyze effect of thinning event-by-event (6 independent thinning levels)

    preliminary results: time distributions more sensitive to thinning than radial or energy distributions
- Release end of 2015 with new hadronic interaction model Sibyll 2.3 and optimized showers for high energy neutrinos (thanks to ICECUBE collaboration)