

## 3<sup>rd</sup> CORSIKA 8 Focus Week

Simulating particle cascades for astroparticle physics



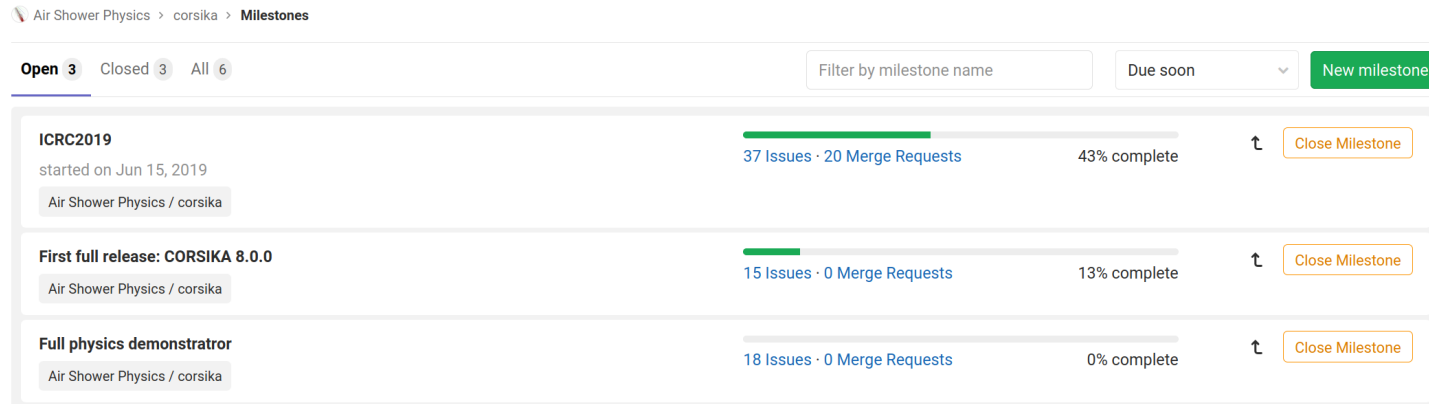
Ralf Ulrich, for the CORSIKA 8 Project  
3. February 2020

# Main goal this week

■ Milestone „ICRC2019“ → Max, please close! By definition this is done.

■ Milestone „full physics demonstrator“

- Decide on scope, maybe insert new intermediate milestone
- [Work on this](#)



Air Shower Physics > corsika > Milestones

Open 3 Closed 3 All 6 Filter by milestone name Due soon New milestone

Milestone Name	Progress	Issues	Merge Requests	Completion	Action
ICRC2019 started on Jun 15, 2019 Air Shower Physics / corsika	<div style="width: 43%;"></div>	37	20	43% complete	Close Milestone
First full release: CORSIKA 8.0.0 Air Shower Physics / corsika	<div style="width: 13%;"></div>	15	0	13% complete	Close Milestone
Full physics demonstrator Air Shower Physics / corsika	<div style="width: 0%;"></div>	18	0	0% complete	Close Milestone

# Agenda

- Main purpose are discussions, we should leave room from them.
- Please propose topics and materials
- There is no strong limit to one contribution per day

Note: Agenda is developing, only the one on indico is up-to-date

MONDAY, 3 FEBRUARY

16:00 → 17:30 Discussion Monday

16:00 Discussion 30m

Welcome to the "3rd CORSIKA 8 Focus Week"  
The aim is to make a major concerted step toward first simulations of both hadrons and e.m. cascades.  
Today we should set our priorities for the coming week and also for the upcoming milestone.

Reference to old CORSIKA physics manual 20m

16:30 Parallel execution, scheduler 1h

Speaker: Anatoli Fedynitch (IESY Zeuthen)

TUESDAY, 4 FEBRUARY

09:00 → 10:30 Discussion Tuesday

09:00 Discussion 30m

We need at least one low-energy hadron interaction model. Could be GHEISHA or URQMD (good for comparisons to CORSIKA7) or HillasSpitting (comparing to AIBES).  
We need to test and finalize the mechanics to switch between high/low energy models for given projectile particles.

09:30 Status of PROPOSAL integration 1h

Speaker: Jan Soedingreko

WEDNESDAY, 5 FEBRUARY

09:00 → 10:25 Discussion Wednesday

09:00 Discussion 30m

We need energy losses and multiple scattering for hadrons and muons.

THURSDAY, 6 FEBRUARY

09:00 → 12:00 Discussion Thursday

09:00 Discussion 1h 30m

10:30 Stack, particles 1h 30m

Speaker: Dominik Baack (TU Dortmund)

FRIDAY, 7 FEBRUARY

15:30 → 17:30 Discussion Friday

15:30 Final discussion 1h

Summarize progress, discuss open points and decide on next goals.

# MRs

Open 13 Merged 137 Closed 21 All 171

Edit merge requests

New merge request

Recent searches

Created date

### WIP: Resolve "Sigma0 not interacting in Sibyll"

I172 · opened 3 days ago by Maximilian Reininghaus Bug

0  
updated 2 days ago

### Layered atmosphere builder

I171 · opened 2 weeks ago by Maximilian Reininghaus Feature request Important ready for code review

3  
updated 6 days ago

### WIP: Include proposal process

I169 · opened 1 month ago by Ralf Ulrich Development Important

1  
updated 1 month ago

### Sibyll small cleanup

I168 · opened 1 month ago by Ralf Ulrich Development ready for code review

0  
updated 1 week ago

### Resolve "Add qgsjetll"

I167 · opened 2 months ago by Ralf Ulrich Development Discussion Feature request Important ready for code review

5  
updated 5 days ago

### Resolve "pythia8 required to build"

I165 · opened 3 months ago by Felix Riehn Bug

7  
updated 2 months ago

### WIP: simplified process sequence based on std::tuple

I158 · opened 7 months ago by Hans Dembinski

14  
updated 7 months ago

### "transparent" observation plane

I156 · opened 7 months ago by Maximilian Reininghaus Feature request ready for code review

6  
updated 2 months ago

### WIP: Resolve "Provide simple process example"

I154 · opened 7 months ago by Maximilian Reininghaus Documentation Feature request

0  
updated 7 months ago

### upload coverage to codecov.io

I138 · opened 8 months ago by Ralf Ulrich Feature request

0  
updated 8 months ago

### WIP: Resolve "cleanup sibyll and pythia interfaces"

I113 · opened 9 months ago by Maximilian Reininghaus ICRC2019 Development Documentation

4  
updated 7 months ago

### WIP: Resolve "Test with larger variety of distributions/compilers"

I95 · opened 11 months ago by Lukas Nellen ICRC2019 Discussion Feature request

5  
updated 8 months ago

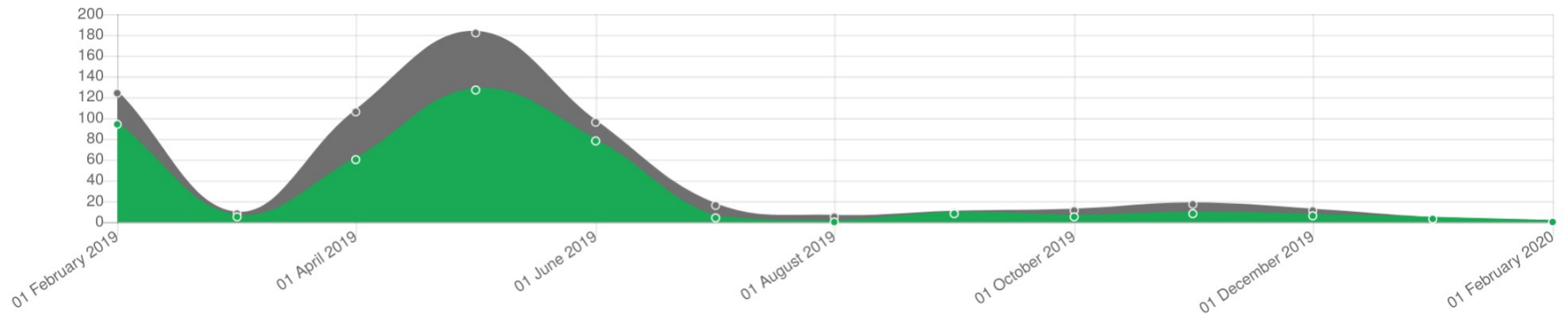
### WIP: Update project docs

I66 · opened 1 year ago by Ralf Ulrich Discussion Documentation

3  
updated 7 months ago

# Continuous integration

Pipelines for last year

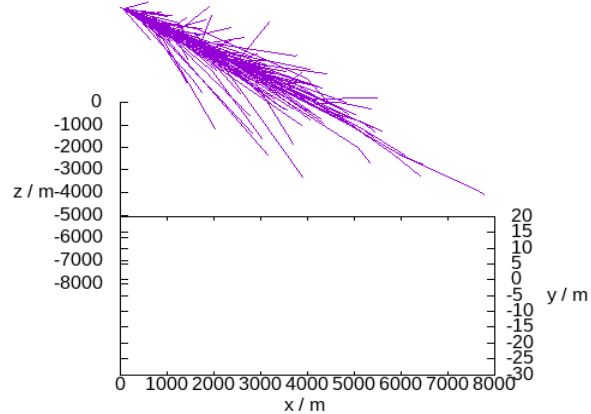


Excellent, stable over long time, tracks activity

# Reminder, Accomplishments

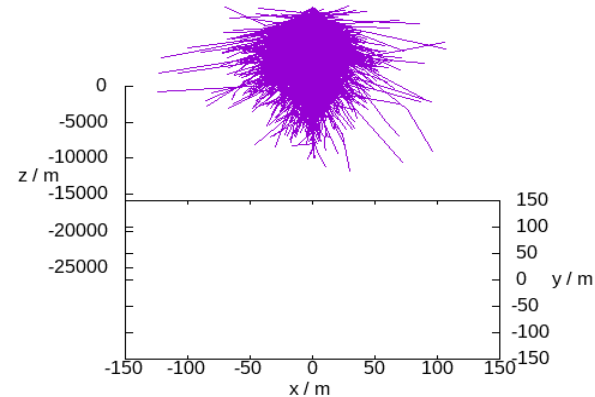
Proton primary, 100TeV, 45deg

CORSIKA 8 preliminary



Iron primary, 1PeV, 0deg

CORSIKA 8 preliminary

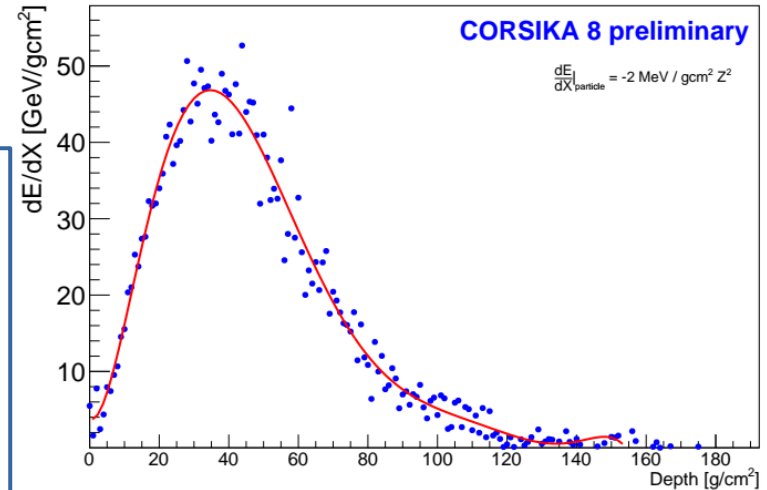


```
...  
auto sequence = sibyll << sibyllNuc << decay << cut << trackWriter;  
cascade::Cascade EAS(environment, tracking, sequence, stack);  
EAS.Init();  
EAS.Run();
```

# Reminder, Accomplishments

- Complete prototype framework
- Static physical units
- Geometry
- Main loop
- Particle stack
- Physics: hadron-core, simple muon prop.

## Also: longitudinal profiles



# Main challenges ahead

- Stack, Particles!
- Processes! Main loop concept!
- Run-time configuration infrastructure
- Particle data output interface and definition
- Logging, also for parallel runs etc.
- Full physics implementation: hadrons plus mu/e/gamma
- Physics validation
- Seamless integration of cascade equations
- Profiling, optimization, vectorization and multi-threading solutions where useful
  
- In 2020: Plan technical journal articles, think about first physics articles



# Upcoming steps

- 3<sup>rd</sup> CORSIKA 8 Focus Week: **3. - 7. February 2020**
- Plan release(s) of next milestone(s): **asap**
- Next general workshop in Heidelberg: **17-21 June 2019**
- 22-24 June 2020, <https://indico.scc.kit.edu/event/667/>

## Upcoming conferences:

- MoriondQCD, ISVHECRI, CRIS, ICHEP, Malargüe?
- ICRC 2021?, CEP 2021?, DIS (March, Stoney Brooks)?, MPI@LHC (Oct, Portugal)?