Histogramming with COAST

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Requirements

Dependencies

For histogramming	ROOT	root.cern.ch
For animations (optional)	gifsicle	packet: gifsicle/ungifsicle

CORSIKA

At least version v6.735. I distribute a version v6.735.patched:

- Improved support for 64bit
- However, no QGSJETII and FLUKA

COAST + COAST-Interface

Version v3r2

Get coast-v3r2.tar.gz and coast-interface-v3r2.tar.gz from

- http://www-ik.fzk.de/~rulrich/coast
- my USB-stick
- somebody, who already copied it ...

Preparation / Environment

Unpack source code

- Change to your favorite directory (e.g. ${HOME}/coast-exercise)
- Unpack tar.gz in this directory
  - `tar xzvf coast-v3r2.tar.gz`
  - `tar xzvf coast-interface-v3r2.tar.gz`
  - `tar xzvf corsika_v6.735.patched.tar.gz`

<1 min

Define environment (→ see script `setEnvironment.[c]sh`)

Location of COAST installation

```
export ${COAST_DIR}=<dir>/coast-v3r2-install
setenv ${COAST_DIR} <dir>/coast-v3r2-install
```

Choice of COAST-Interface

```
export ${COAST_USER_LIB}=<dir>/coast-interface-v3r2/Histogram
setenv ${COAST_USER_LIB} <dir>/coast-interface-v3r2/Histogram
```

Add ${COAST_DIR}/lib and ${COAST_USER_LIB} to your LD_LIBRARY_PATH

```
export LD_LIBRARY_PATH=${LD_LIBRARY_PATH}:${COAST_DIR}/lib:${COAST_USER_LIB}
setenv LD_LIBRARY_PATH ${LD_LIBRARY_PATH}:${COAST_DIR}/lib:${COAST_USER_LIB}
```

Compilation / Installation

COAST + COAST-Interface

- `cd <dir>/coast-v3r2`
- `autoreconf -if`; `configure`; `make install`

<3-4 min

CORSIKA

- `cd <dir>/corsika_v6.735.patched`
- `./corsika-install`
- Select: QGSJET01 and GHEISHA
- Options: Thinning (5), Slant (9) and ROOTRACK (q)
- Confirm to use external COAST (by pressing `enter`)
- Ignore warning concerning FLUKA (by pressing `enter`)
- Finish selection and start compilation (by pressing many `enter`s)

<2-3 min

Customization of Histogramming

Edit: `${COAST_USER_LIB}/TUser.cc`:

Function: `void TPlotter::InitParticles()`

```
fParticles[3] = ParticleDef("electron", 4);
```

(e.g. γ:1, e^-:2, e^+:3, μ^-:5, μ^+:6, π^0:7, π^+:8, π^-:9, n:13, p:14, $\overline{p}$:15)

Function: `void TPlotter::InitHistograms(HistDef& hists)`

```
hists["2"] = new TProfile("hAngle", "angle",
                          6, -2.5, 2.5, "s"); //[lg(r/rm)]
hists["2"]->SetMarkerStyle(21);
hists["2"]->SetXTitle("log_{10}(r/r_{m})");
hists["2"]->SetYTitle("Theta   [deg]");
```

Function: `TPlotter::FillHistograms(...)`

```
((TProfile*)hists["2"])->Fill(log10(r/rm), theta/deg,
                              weight);
```

Don't forget: `cd ${COAST_USER_LIB}; make`

Run CORSIKA

```
cd <dir>/corsika_v6.735.patched/run
./corsika6735Linux_QGSJET_gheisha < coast-inputs
```

<1 min

(e.g. the `coast-inputs` CORSIKA steering card: proton, 10^{17} eV, 20°)

Read output

```
root DAT000001_1.hist.root
TProfile* h = 0;
data_electron->SetBranchAddress("hAngle_electron", &h);
data_electron->GetEntry(10);
h->Draw();
```

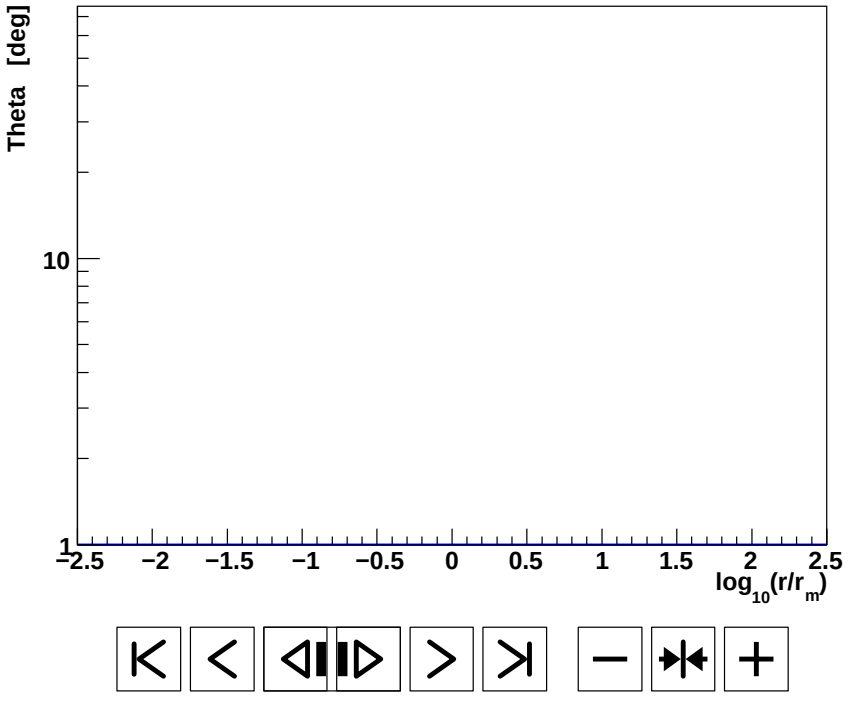
Generate animated histograms

```
${COAST_USER_LIB}/MakeAnim DAT000001_1.hist.root
gifview DAT000001_1.hist_hAngle_electron.gif
```

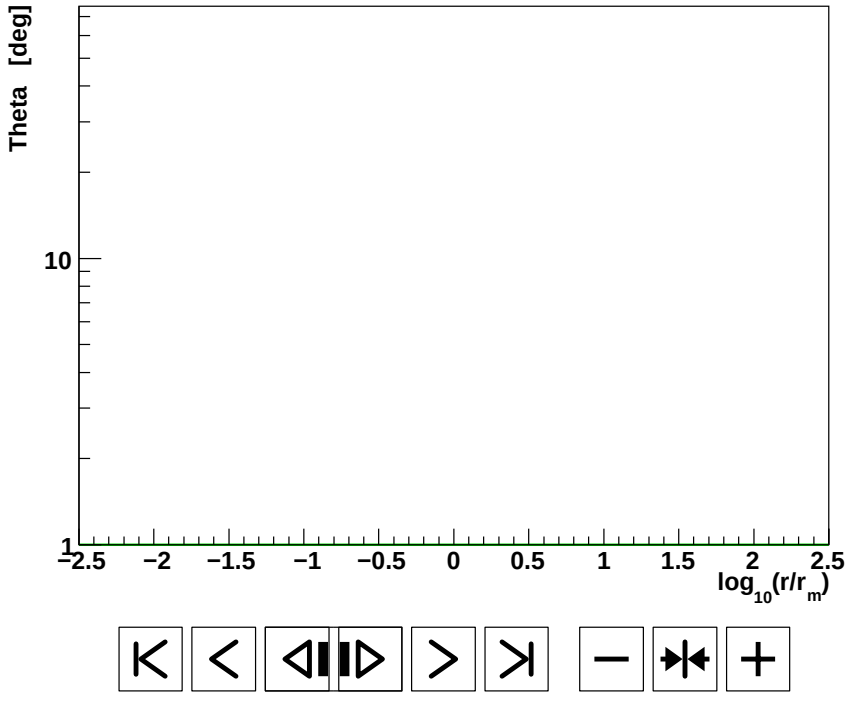
1 min

Result

electrons



muons



⇒ Powerful tool for histgoramming of air showers
⇒ Easy to use/customize