



AMANDA-II EVENT SIMULATION STATUS REPORT

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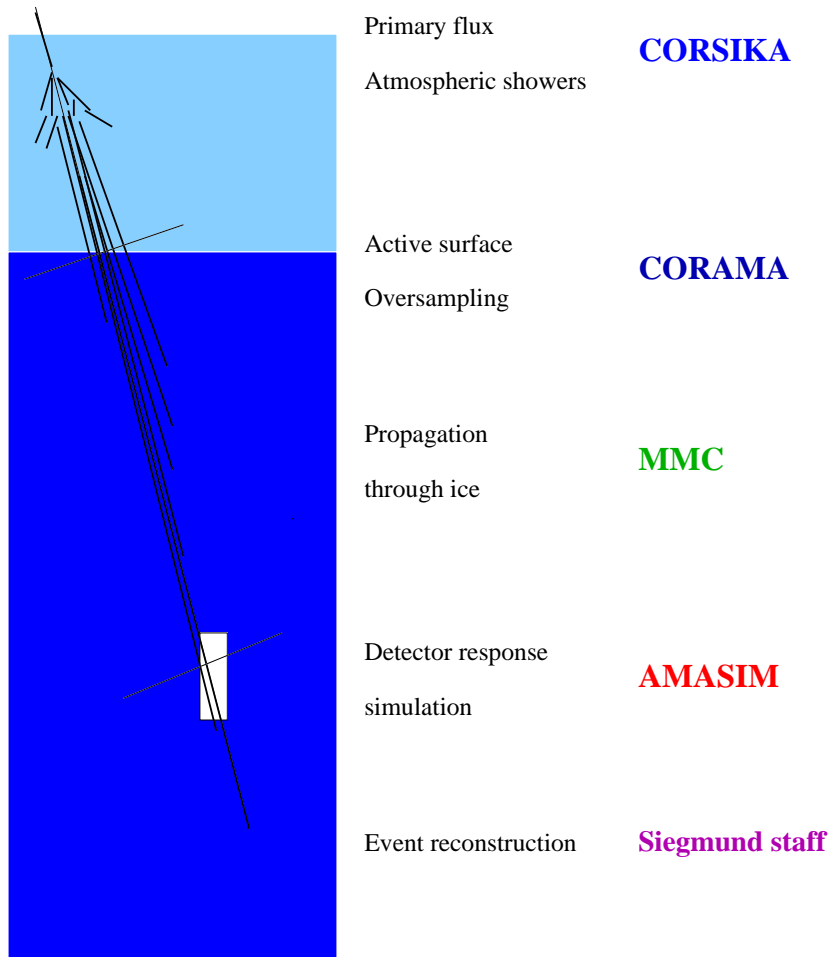


Speaking about

- The simulation so far
 - Software Chain
 - Detector configuration (2000)
- Improvements
 - PTD/Photonics
 - Ice properties
 - Detector systematics ?
- What do we have now ?
 - UW-Physics (2000)
 - UW-Condor productions (2000)
 - Other productions (years < 2000)
- Conclusions

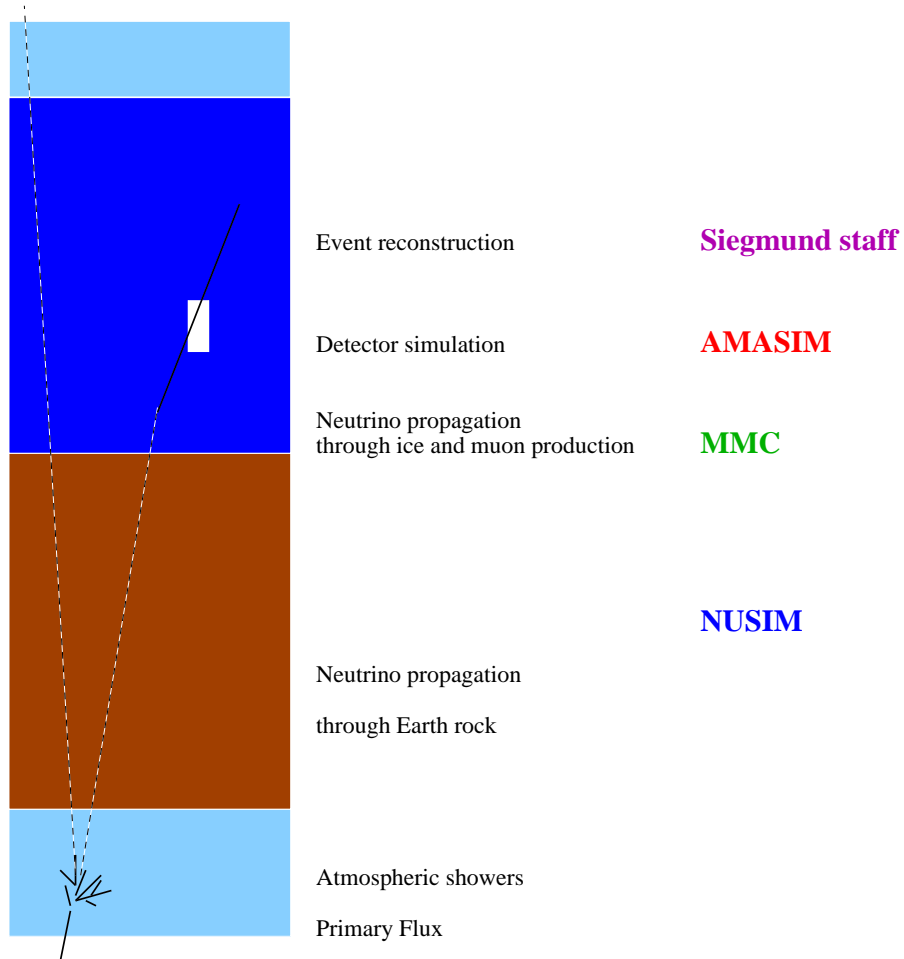
Simulation so far

Down-going muon chain



Simulation so far

Up-going muon chain





Simulation so far

Simulation configuration

- pCORSIKA/Corama
 - Primary energy up to $10^{20} eV$
 - Possibility to weigh the primary spectrum
 - 100,000 primaries / file
 - $\times 100$ Corama oversampling
- MMC v1.05
- AMASIM mandarin-1.1
 - Detector settings for 2000
 - * Specific electronics settings
 - * Trigger configuration info from filter effort
 - Ice Properties
 - * Use of MAM photon tables (Integral/Differential)
- Reconstruction
 - Same chain used for 2000 filter
 - * muon (L2), casc (L1), HE (L1), Minbias (L2 w/o cuts)
 - Re-trigger within 3 different periods
 - See talk by Tonio/Elisa B.



Simulation so far

Comments on Simulation configuration

- pCORSIKA
 - CORSIKA v5.62 / QGSJET (Dec 5, 1997)
 - dCORSIKA (v6.014) ?
 - Use of CORSIKA for ν ?
- NUSIM
 - Package from ν generation to propagation
 - Uses PROPMU for rock/ice $\nu \Rightarrow$ MMC
- MMC
 - Very stable and robust
- Amasim
 - The most complex program...see Stephan talk
 - Still serious problems with Photonics
 - * Too slow and unstable
 - * wrong time response



Simulation so far

Detector configuration (2000)

- Stability study (Mathieu R.)
 - *Bad* OM list for the whole year
 - Determination of 3 stable periods
 - Re-trigger data within each period
- Simulation procedure
 - Trigger simulation with OM *common list*
 - 3 cleaning/retrigger/reco chains
 - * Period 1: day 44 - 125
 - * Period 2: day 126 - 244
 - * Period 3: day 245 - 315
 - Same event sample in each period
 - Re-trigger level only for comparisons

Stability study for 2001/2002 under way

Compromise to merge 2000/01/02 into one simulation chain



Improvements

- PTD/Photonics

- Still *Goobar* measurements used
- *Sudhoff* measurements available for glass
- New gel measurements also now available (Elisa R.)
- Photonics cannot be used for event generation
 - * Still don't know if it improves results

- Ice properties

- very delicate issue
 - * MAM is already an improvement from *Kurt Model*
 - * Absorption: from residual for close reconstructed tracks
 - Use of *very well reconstructed* tracks
 - $\lambda_a \sim 100m$ closer to Kurt measurement
 - It seems very difficult to disentangle λ_a from λ_s
 - * Kurt measurements use a MC different from PTD
 - comparison under way, though not trivial

- Detector systematics

- MC quality check as the basis of any analysis
- Small deviations big effect at high rejection
- Trig rate is just a number: need deep checks



What do we have now ?

- UW-Physics

- Slow generation of down/up-going muon events
- Up to reco L1/L2 (p1,2,3) muon/casc/HE/mb
- See the numbers ...

- UW-Condor

- UW Computer Science supports our effort
 - * Erik Paulson, Miron
- Simulation chain (up to AMASIM so far)
 - * Technical challenges to solve
 - MMC produces big outputs
 - AMASIM is complex with 1/2 GB photo-tables
 - * Condor checkpoint optimization
- Condor benefited from testing our MC
- We benefit from their big potential
- See the numbers ...

- Other productions

- Penn/Bartol pCORSIKA files ($\sim 15d$)
 - * Used for Ignacio 1997 B10 cascade analysis
- Brussels 1999 B10 files



UW-Physics Production

Down-going muons with MAM ice model

| Step | evt/file | #runs | #tot | sec | size |
|----------|---------------------|-------|---------|-------|--------|
| pCORSIKA | $10^5 \times 100 p$ | | | 2,100 | 3 MB |
| Corama | 98,000 μ | | | 80 | 3 MB |
| MMC | - | | | 450 | 45 MB |
| Amasim2 | 2,800 | 870 | | 9,000 | 6.6 MB |
| muon.L1 | 22 | 870 | 19,100 | 1,000 | 74 KB |
| muon.L2 | 7 | 870 | 6,100 | 1,000 | 34 KB |
| mb.L2 | 2,500 | 379 | 950,000 | 2,500 | 7.8 MB |
| cascl.L1 | 37 | 870 | 32,000 | 120 | 134 KB |
| HE.L1 | 27 | 870 | 24,000 | 120 | 480 KB |

the simulated lifetime is $870 \times 53.94 = 13 h$

Each reco run for each period

Everything is saved on disk

alizarin:/data/disk4/mass01/reco



UW-Physics Production

Up-going muons with MAM ice model

| Step | events/file | #runs | CPU (sec) | size (MB) |
|-------------|--------------|---------------|--------------|-----------|
| Nusim ν | $10^5 \nu$ | 10×2 | 570 | 26 |
| Nusim μ | 85,200 μ | 10×2 | | 26 |
| MMC | - | | 470 | 196 |
| Amasim2 | 14,300 μ | 10×2 | 69,000 (19h) | 125 |
| muon.L1 | 10,800 | 7×2 | 6,700 (2h) | 100 |
| muon.L2 | 10,300 | 7×2 | 15,000 (4h) | 100 |
| casc.L1 | 1,800 | 5×2 | 1,000 | 15,000 |
| HE.L1 | 7,200 | 5×2 | 1,500 | 100 |

Each reco run for each Period

```
alizarin:/data/disk4/mass01/reco
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UW-Condor Production

Down-going muons with MAM ice model

| Step | evt/file | #runs | CPU (h) |
|----------|----------|---------|-------------|
| Amasim2 | 1,000 | 10,000 | |
| muon.L1 | 810 | 100 ÷ 1 | |
| muon.L2 | 260 | 100 ÷ 1 | |
| mb.L2 | | | |
| casc.L1 | | | |
| HE.L1 | | | |
| Total | | | 15 – 19,000 |
| CPU peak | | | 386 |

the simulated lifetime is $10,000 \times 19.25 = 2.23 d$

Each reco run for each period

Only Reco files are saved on disk

alizarin:/data/disk4/simulation/2000/reco



Conclusions

- We have a massive simulation chain working
- Condor experience is a success
 - Continue to use it for 2000/01/02/.../IceCube
 - Full Support from UW Computer Science
 - 30 d production
- Never give up for a better simulation
 - AMANDA-II is a big improvement wrt B10
 - Hot topics such as X/talk & stability on the list
 - Ice properties understanding & PTD/Photonics tools
 - Detector sensitivity and OM behavior in the hole
- Extend simulation to > 2000
- Jim Braun (UW undergrad) on Java Interface
 - ON-line monitoring of UW simulation productions
 - Report statistics/numbers in a Web Page
 - Easily portable to Data Filter Monitoring
- AMANDA-II Simulation Page

`http://amanda.physics.wisc.edu/simulation`