MONOPOLE SEARCH

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- Berkeley, March 18, 2005

ACTIONS SINCE UPPSALA

- **re-processed the HE-stream of 4 years of AMANDA-II data**
- **re-generated PTD-tables for monopoles for 4 different velocities using "BULKMAM" ice instead of "KURT" ice**
- **re-generated signal and BG (corsika) with BULKMAM-ice**
- **written a software tool that performs a discriminant analysis (using *boost::numeric::ublas*)**

4-YEARS RE-FILTERING

PRE - PROCESSING

OM-Selection:

added 2 OMs (639, 659) without ADC-calibration to bad-OM list
added OM 410 to bad-OM list of 2000 period II (thanks Arvid)

Hit-Selection:

TOT-cleaning

Re-trigger:

24-fold multiplicity

Hit-Selection:

0.1 p.e. < AMP < 1000 p.e.
Local coincidence: 2nd hit within Δt=500 ns, ΔR=100 m

3 STREAMS

Minimum bias (1%)

every 100th event
+ re-trigger

UHE ν / rel. Monopoles

hit-selection time window:
14000:32000ns (calibrated)

Nhits > 140
FRAC1 < 0.72

Sub-relativistic:

early hits:
-1364:18000ns
(un-calibrated)

Nearly > 25

EVENT RATES OVER 4-YEARS

Seasonal variations:

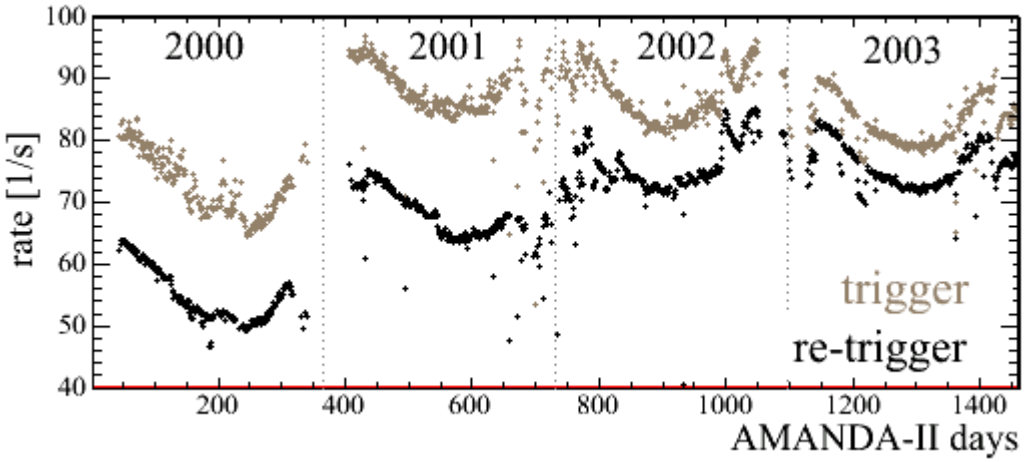
as is known, are due to **temperature variations of the atmosphere** above the South Pole

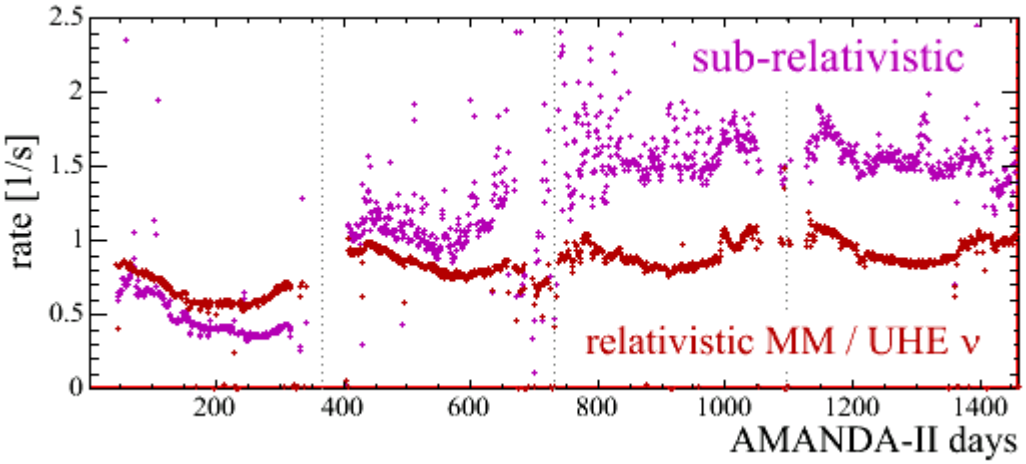
Sub-relativistic:

Rising due to shift of trigger-time?

trigger-times:

2000 : ~22,875 ns
2001 : ~22,855 ns
2002 : ~22,520 ns
2003 : ~22,600 ns





(Re-) Trigger-rate:

rising with number of alive OMs

bad OM-lists:

2000 : ~ 150 OMs
2001 : 99 OMs
2002 : 98 OMs
2003 : 64 OMs

UHE ν / relativistic MM:

reduction of data-rate to ~1% of original amab-triggers

MONTE CARLO SIMULATION

BULK - MAM ICE

CORSIKA

Monopole signal:

photon-tables for 4 different velocities **β = 1.0, 0.9, 0.8, 0.76**

Atms μ background:

Wiebel-Sooth (no knee , default) : $2.2\ 10^{11}$

Glasstetter (two component model)

protons (E^{-2}) : $9.0\ 10^{8}$

iron (E^{-2}) : $1.4\ 10^{9}$

Hörandel (poly-gonato) : $5.6\ 10^{10}$

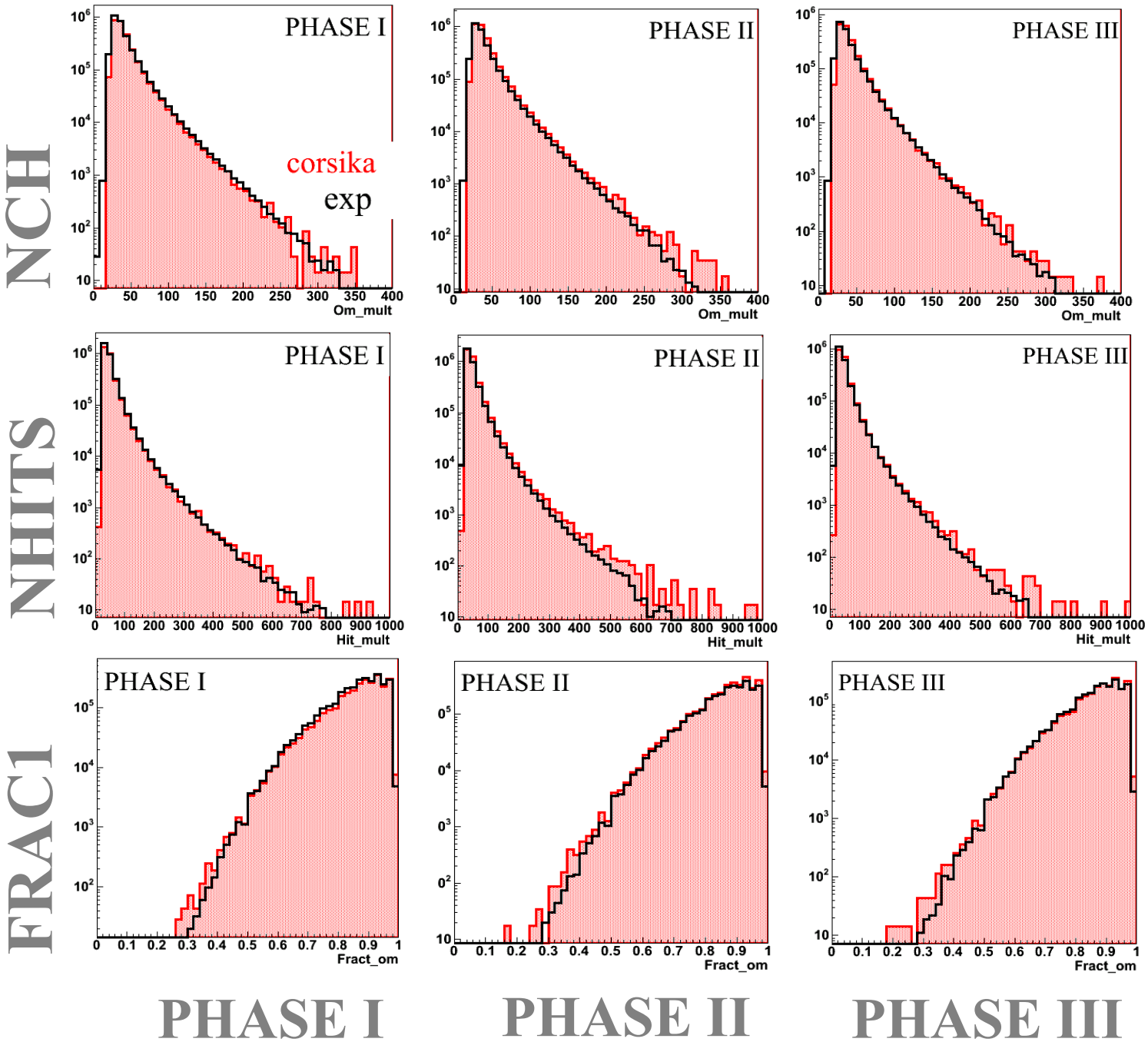
oversampling $\Delta\gamma = -1.0$: $7.8\ 10^{8}$

Systematics:

ice : MAMINT (layered), BULK f=0.96 ("B10 – ice")

atmospheres : March, July (default = October)

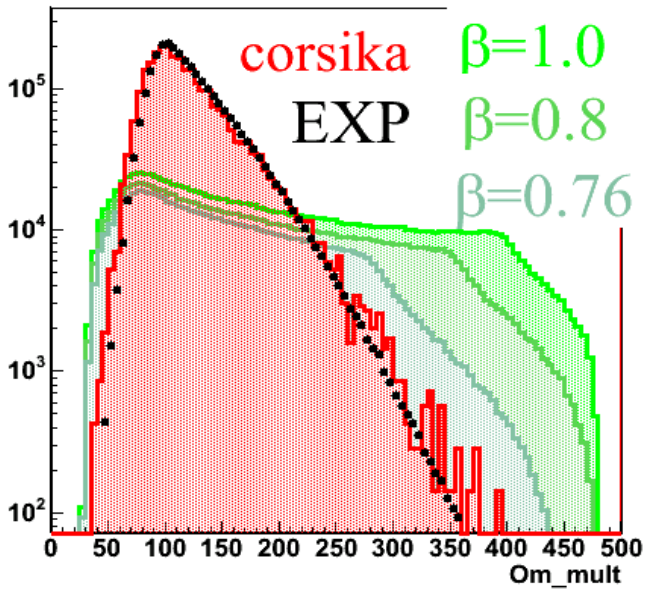
2000 EXP. vs MC DATA (minimum bias)

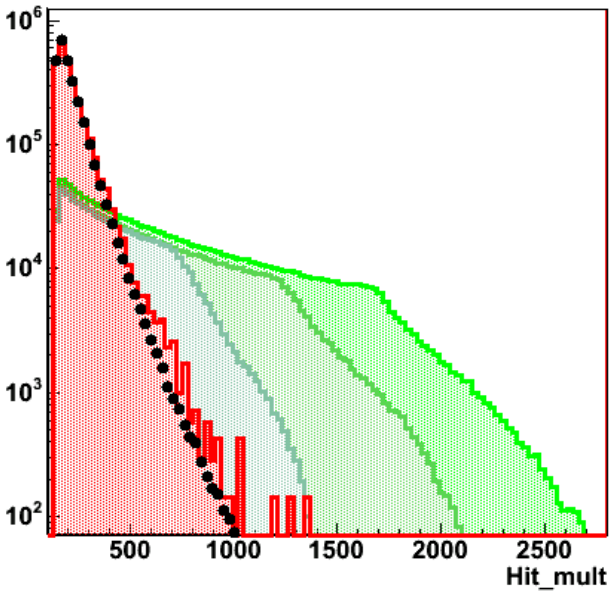


- **MC trigger-rate ~ 17% too low**
- **good agreement after renormalization**
- **Seasonal variations cause a lack of high multiplicity events during PHASE II**

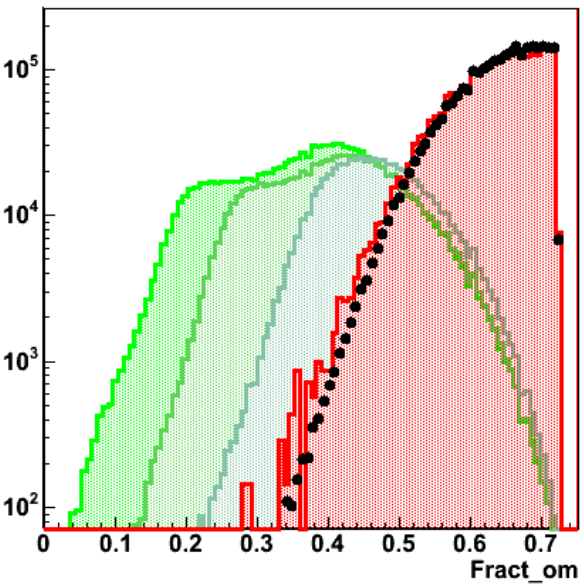
2000 EXP. vs MC DATA LEVEL I

PHASE III





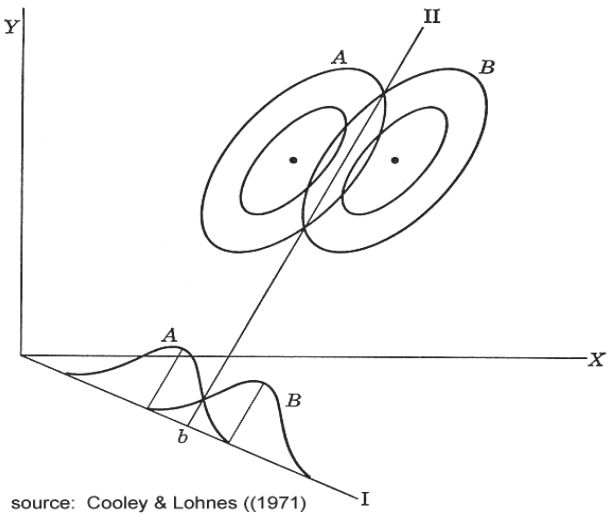
NHITS



FRAC1

- **good agreement of channel- and hit-multiplicities at level 1**
- **we will further exploit light yield ...**

DISCRIMINANT ANALYSIS

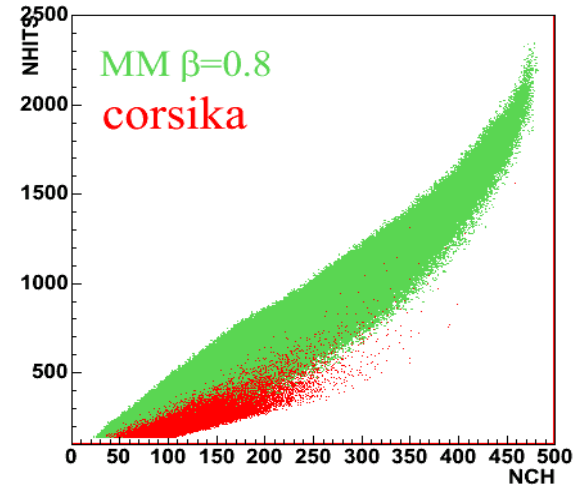


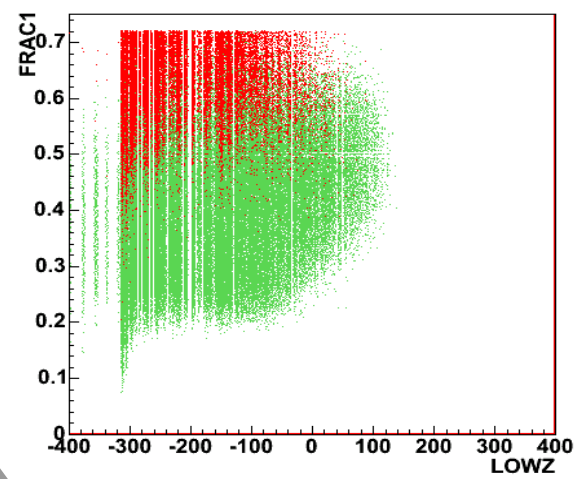
source: Cooley & Lohnes ((1971)

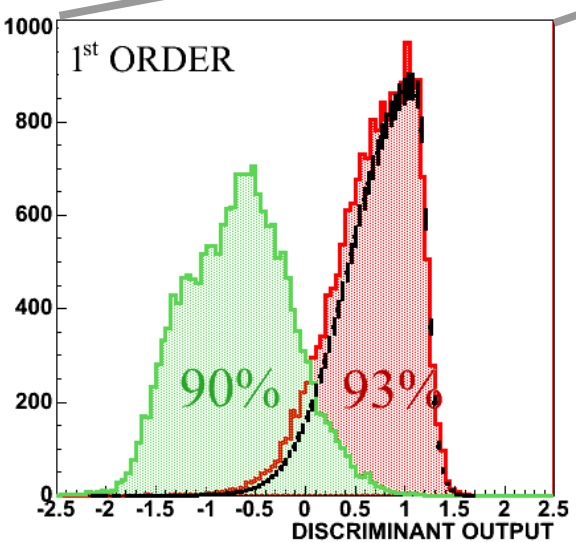
Figure 9.1.

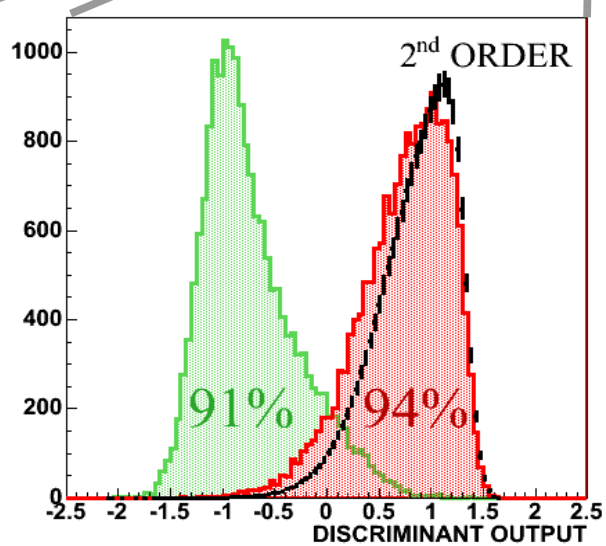
- **find projection in multi-dimensional space of correlated event-features that yields optimal separation**

NHITS
NCH
FRAC1
LOWZ



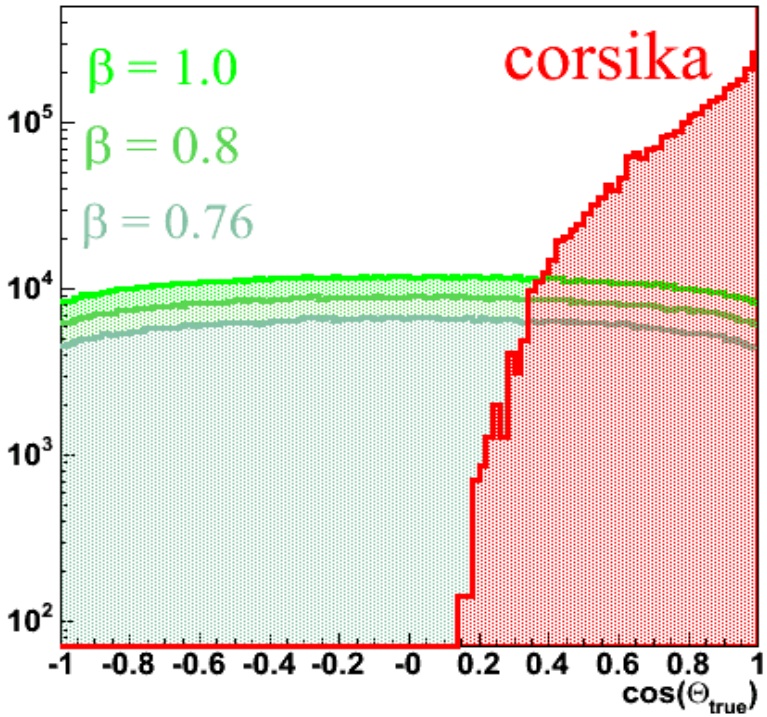






- **GOOD SEPARATION** !

NEXT STEP



- **apply reconstruction**
- **to be done ....**

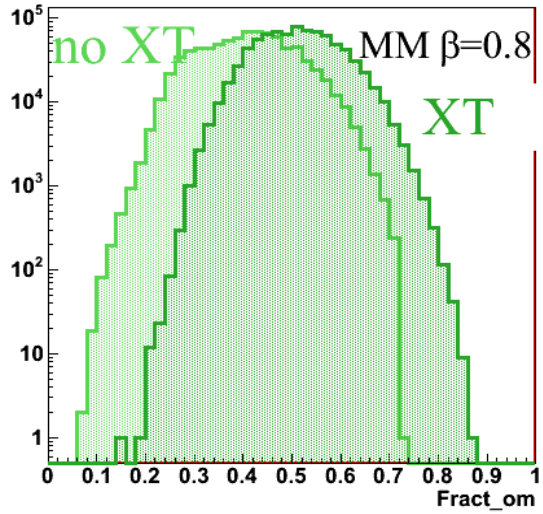
OPEN ISSUE : X-TALK CLEANING

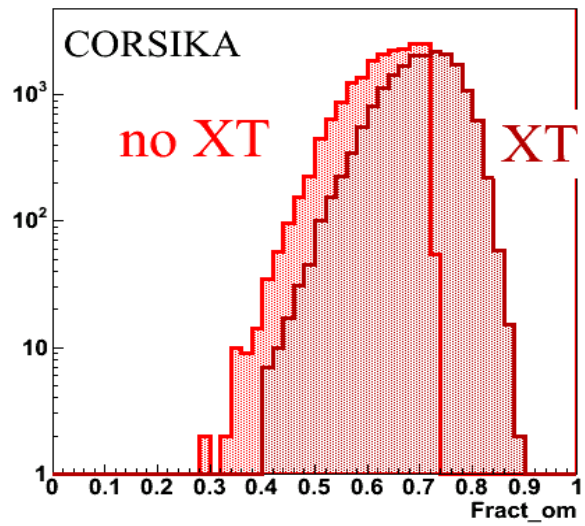
- **Sieglinde XT-Talk cleaning was buggy**

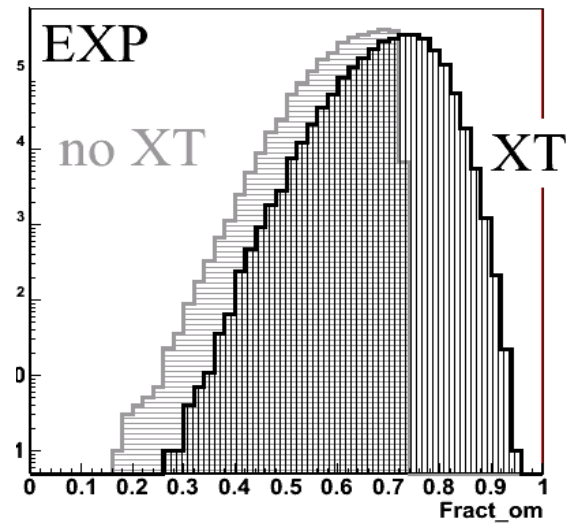
- **don't use the “XTClean” hitsel. from the 4-years-sample!!!**
- **bug was corrected only in January 2005, so XT cleaning has to be redone**

APPLICATION OF CORRECTED X-TALK CLEANING

FRAC1

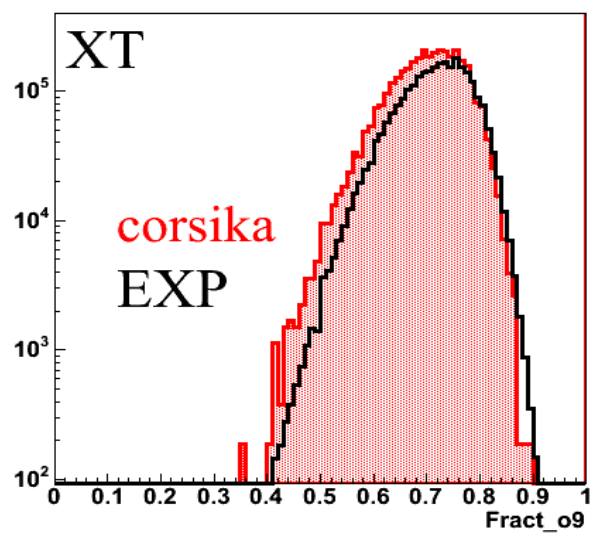






- **XT-talk cleaning removes a lot of hits in both experimental data and Monte Carlo**

- **agreement between MC and Exp. data seems a little worse after XT-cleaning...**



SUMMARY

- 4 years AMANDA-II HE stream is available
- BULKMAM Monte Carlo shows good agreement with experimental data after re-normalization
- Discriminant analysis using seems to be a powerful and simple tool to reject background
- Seasonal variations at (re)trigger level