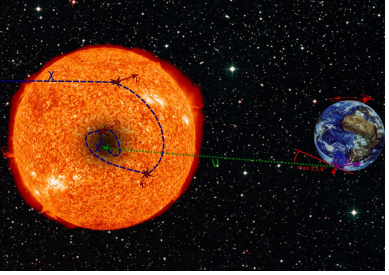
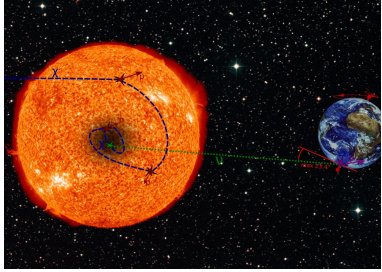


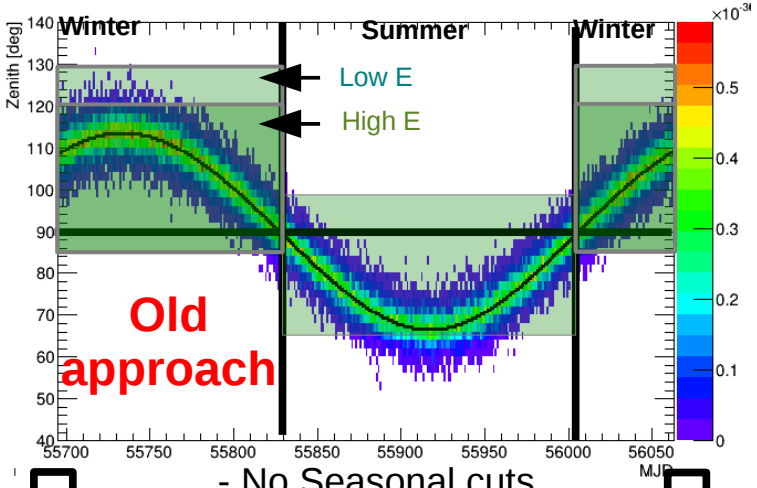
Solar WIMP Summary

Marcel Zoll, Stockholm



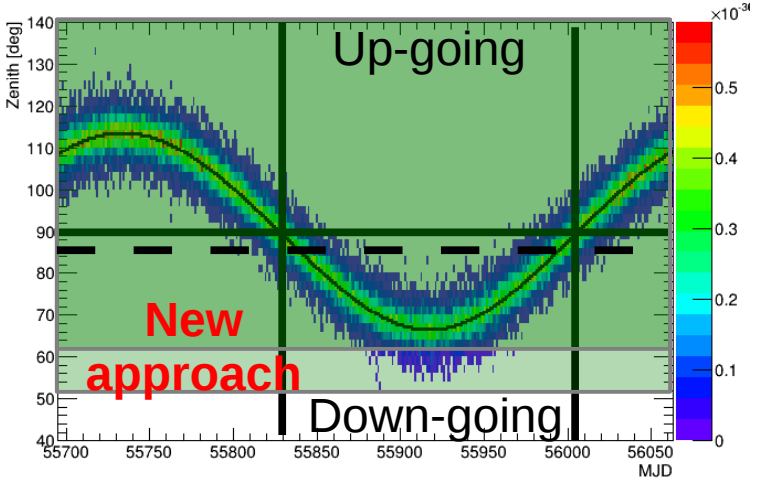
Initial Zenith accaptance L2

sWIMP m100ch5 Muon_zenith



- No Seasonal cuts
- Better reconstructions at later cut level possible
- More events in the selection, let LLH decide

sWIMP m100ch5 Muon_zenith



Exploit more variables available event by event,
For example the arrival angle for signal significance,
model the signal energy-spectrum

Improved solar LLH ansatz

$$\mathcal{L}(\mu) = \prod_k L(\mu_k, \mathcal{E}_k),$$

For each energy slice

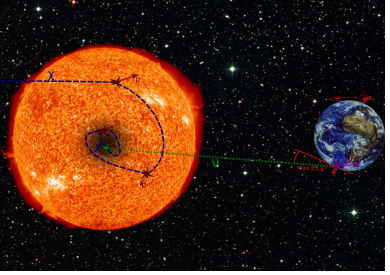
$$L(\mu_j, \mathcal{E}_j) = \prod_{i(E\in\mathcal{E}_j)} f_{e_i}(\theta_i, \Psi_i | \mu_j, \mathcal{E}_j) \qquad \mu_j = \mu \frac{\sum_{E\in\mathcal{E}_j}}{\sum_k \sum_{(E\in\mathcal{E}_k)}} = \mu \frac{N_j}{N_{\mathrm{obs}}}.$$

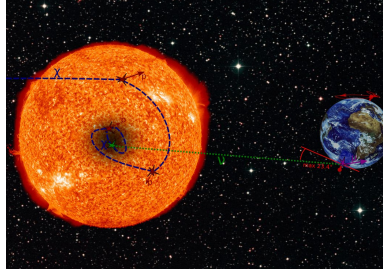
signal background

$$f_{e_i}(\theta_i, \Psi_i | \mu_j, \mathcal{E}_j) = \frac{\mu_j}{N_j} f_{\mathrm{s}}(\theta_i)\varepsilon_j f_{\mathrm{s}}(\Psi_i)\varepsilon_j + \left(1 - \frac{\mu_j}{N_j}\right) f_{\mathrm{bg}}(\theta_i)\varepsilon_j f_{\mathrm{bg}}(\Psi_i)\varepsilon_j$$

PDF of arrival angle — PDF of angle to the Sun — smeared by Paraboloid-est.

- Developed analysis tools are useful also for others (WimpSim-Reader, HiveSplitter, CoincSuite, …)
- Stronger vetos by more physics-hits retained
- Further improved veto-methods under implementation
- improved Likelihood under implementation

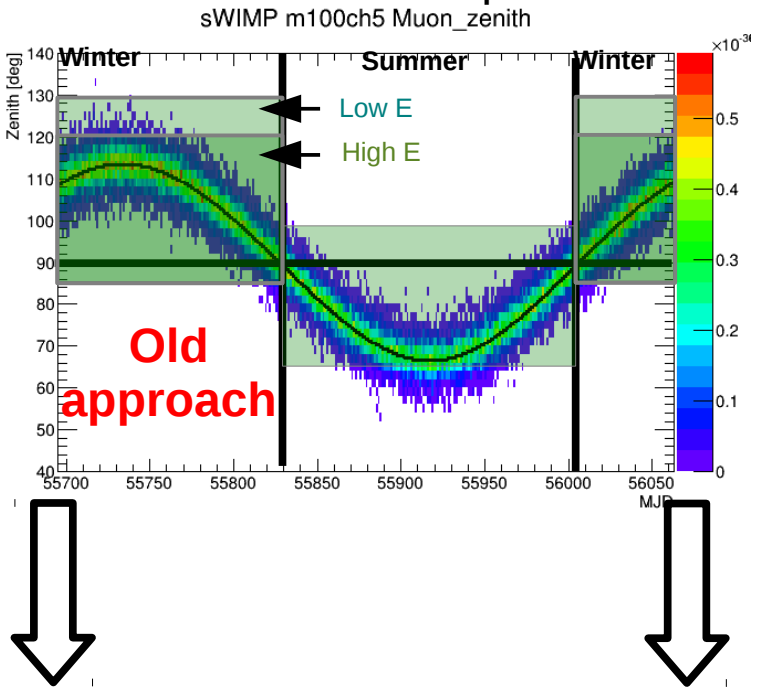


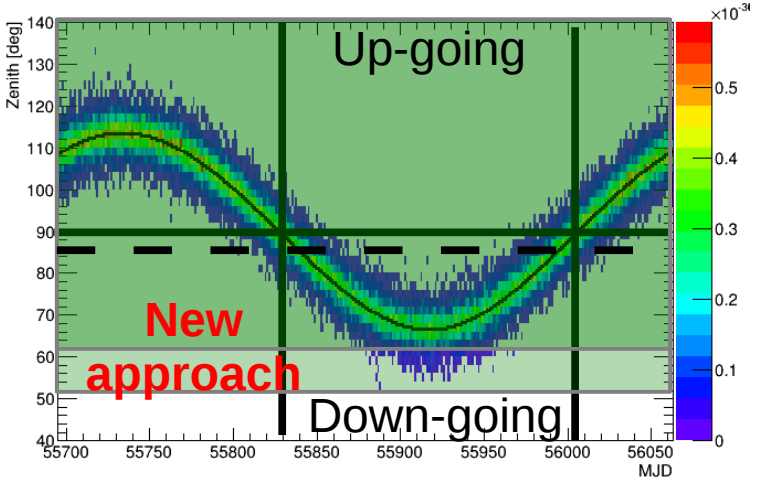


SolarWIMP-Analysis

Marcel Zoll, Stockholm

Initial Zenith acceptance L2





IC79 (2010-2011):
Seasonal Cuts:
- Summer Down-Going !Containment!
- Winter Up-Going !Quality!

3 distinct data-sets

IC86+ (2011-):
All year round analysis

Single Treatment for data
Better reconstructions possible at higher processing stages
Likelihood itself can decide about signal content

SolarWIMP-Analysis

Marcel Zoll, Stockholm

Previous solar LLH-ansatz

$$\mathcal{L}(\mu) = \prod_k^{N_{\rm obs}} f(\Psi_i|\mu) \qquad f(\Psi_i|\mu) = \frac{\mu}{N_{\rm obs}} f_{\rm s}(\Psi) + (1 - \frac{\mu}{N_{\rm obs}}) f_{\rm bg}(\Psi)$$

IC79 (2010-2011):
LLH dependent on Psi only

Improved solar LLH-ansatz

$$\mathcal{L}(\mu) = \prod_k L(\mu_k, \mathcal{E}_k),$$

For each energy slice

$$L(\mu_j, \mathcal{E}_j) = \prod_{i(E\in\mathcal{E}_j)} f_{e_i}(\theta_i, \Psi_i|\mu_j, \mathcal{E}_j) \qquad \mu_j = \mu \frac{\sum_{E\in\mathcal{E}_j}}{\sum_k \sum_{(E\in\mathcal{E}_k)}} = \mu \frac{N_j}{N_{\rm obs}}.$$

signal background

$$f_{e_i}(\theta_i, \Psi_i|\mu_j, \mathcal{E}_j) = \frac{\mu_j}{N_j} f_{\rm s}(\theta_i)_{\mathcal{E}_j} f_{\rm s}(\Psi_i)_{\mathcal{E}_j} + (1 - \frac{\mu_j}{N_j}) f_{\rm bg}(\theta_i)_{\mathcal{E}_j} f_{\rm bg}(\Psi_i)_{\mathcal{E}_j}$$

PDF of arrival angle

PDF of angle to the Sun

smeared by Paraboloid-est.

IC86+ (2011-):
LLH dependent on Psi, Zenith, Energy
Reconstruction-estimators included

Use of Energy-slices
- takes into account worsened performance at low-E end
- approx. signal-energy-spectrum

SolarWIMP-Analysis

Marcel Zoll, Stockholm

Further Improvements:

Stronger used of hit-based veto instead of variable-based
Better coincident Event suppression (50%)
Improvements of Ice&Detector-simulation (IceSim4)
WimpSim-Simulation now time-base instead of direction-based
Use of better reconstructions using all Photon-Hits