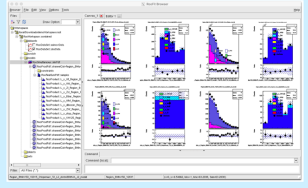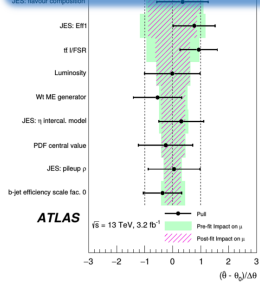# (Exercises - day 3)

Todays exercises

ex16 – bias & outliers

Visualization of model predictions in observable space useful diagnostic!

- Localize fluctuations in templates that constrain/pull fits

- Observe magnitude of model change with variation of NPs within uncertainty

`'ex16.C'`

NP bias or constraint can be due to
1) Statistical fluctuation in data or template (common)
2) Invalid (over)somplified NP model (common)
3) Genuine physics information (not common)

If impact large: always investigate and fix as needed
If impact is small, may ignore, use your judgement

Instructive to look both at *expected* and *observed* NP rankings
- Expected has no data fluctuations (Asimov)
- Additional pulls/constraints in 'observed' NP rankings have origin in data

ATLAS

√s = 13 TeV, 3.2 fb⁻¹

JES: flavour composition
JES: Eff1
tt̄ I/FSR
Luminosity
Wt ME generator
JES: η intercal. model
PDF central value
JES: pileup ρ
b-jet efficiency scale fac. 0

$(\hat{\theta} - \theta_0)/\Delta\theta$

ex18 – convolution

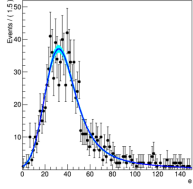### FFT Convolutions in RooFit

`'ex18.C'`

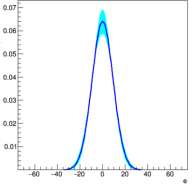- Fourier convolution implement in FCONV operator

```
RooWorkspace w("w") ;
w.factory("Landau::phys(e[0,150],mean[30,0,60],sigma[5,1,10])") ;
w.factory("Gaussian::resol(e,0,sigma_gauss[10,0.1,20])") ;
w.factory("FCONV::conv(e,phys,resol)") ;

RooDataSet* d = w.pdf("conv")->generate(*w.var("e"),1000) ;

RooFitResult* r = w.pdf("conv")->fitTo(*d,Save()) ;
```
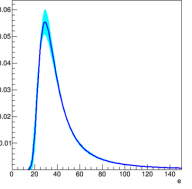
Observed distribution   **Fitted kernel function**   **Fitted theory distribution**

CPU time of fit = 400msec (1000 events, 53 likelihood evaluations)