

# Astrostatistics

Wednesday, 30 January 2019

- Statistics Foundations
  - Ivezic Ch 4 “Classical Statistical Inference” & Ch 5 “Bayesian Statistical Inference”
  - F&B Ch 3 “Statistical Inference”
- Soon: Fitting Statistical Models to Astronomical Data
  - Hogg, Bovy & Lang. “Data analysis recipes: Fitting a model to data”.  
<https://arxiv.org/abs/1008.4686>

# Fitting Models to Astro Data

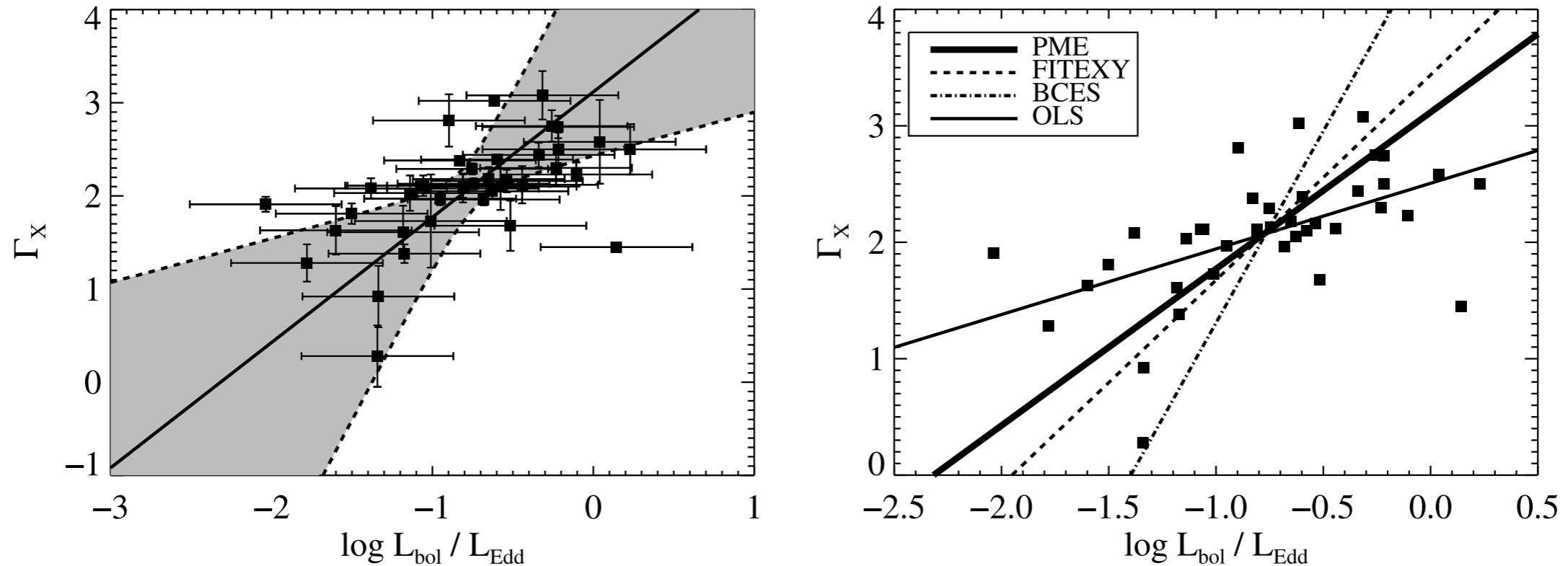
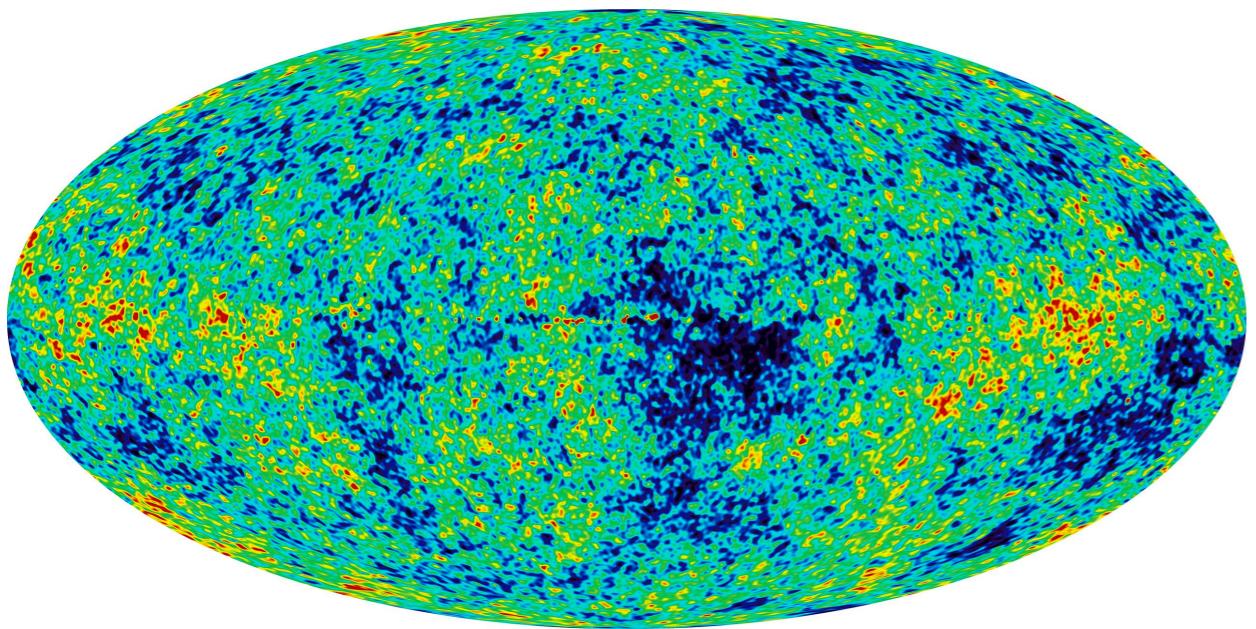


FIG. 10.—X-ray photon index  $\Gamma_X$  as a function of  $\log L_{\text{bol}} / L_{\text{Edd}}$  for 39  $z \lesssim 0.8$  radio-quiet quasars. In both plots, the thick solid line shows the posterior median estimate (PME) of the regression line. In the left panel, the shaded region denotes the 95% ( $2\sigma$ ) pointwise confidence intervals on the regression line. In the right panel, the thin solid line shows the OLS estimate, the dashed line shows the FITEXY estimate, and the dot-dashed line shows the BCES( $Y|X$ ) estimate; the error bars have been omitted for clarity. A significant positive trend is implied by the data.

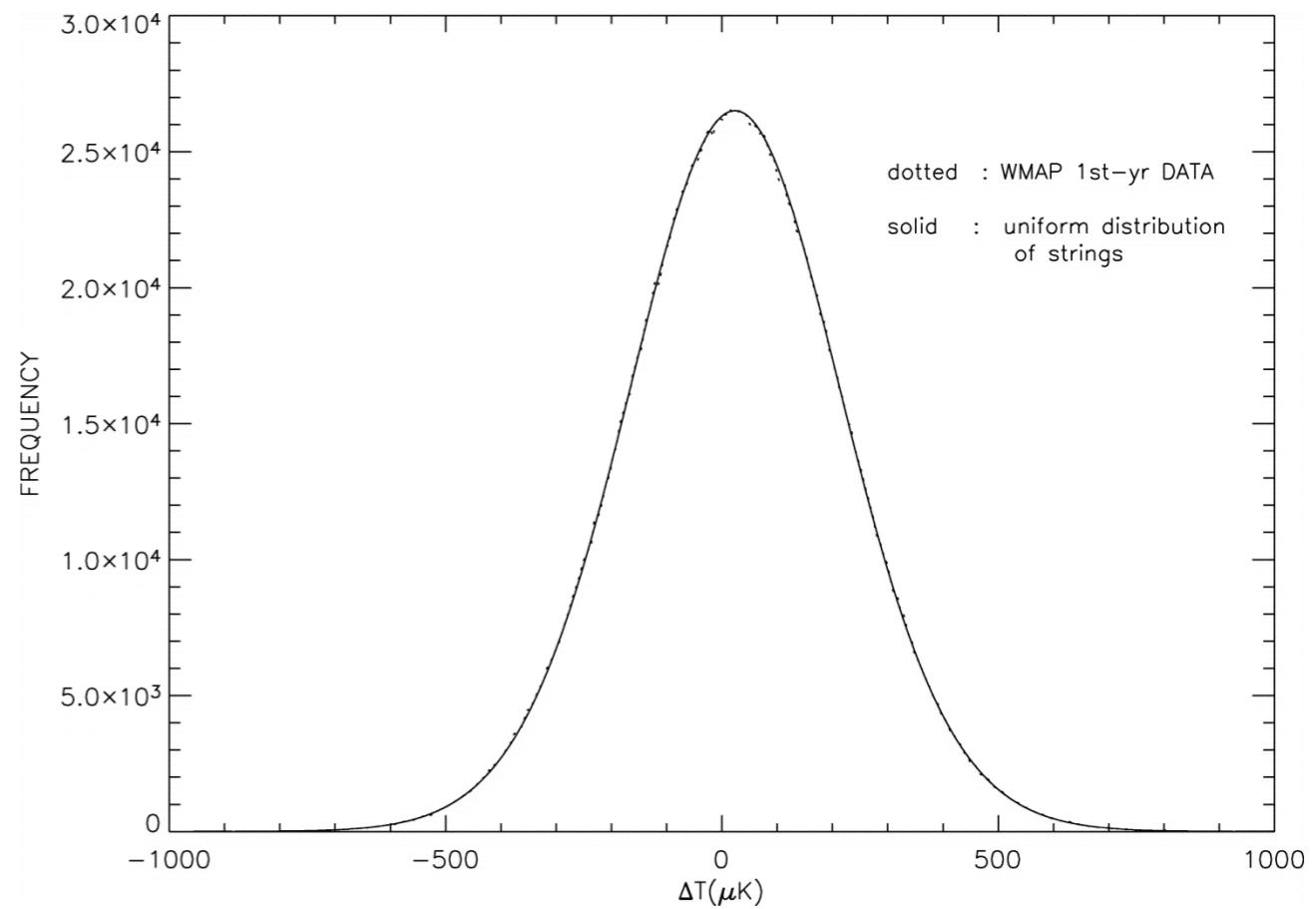
Modelling heteroskedastic, correlated measurement errors in both  $y$  and  $x$ , intrinsic scatter, nondetections, selection effects

B. Kelly et al. 2007, “Some Aspects of Measurement Error in Linear Regression of Astronomical Data.” The Astrophysical Journal, 665, 1489

# Cosmic Microwave Background



WMAP of the sky



Gaussian distribution of temperatures at each pixel