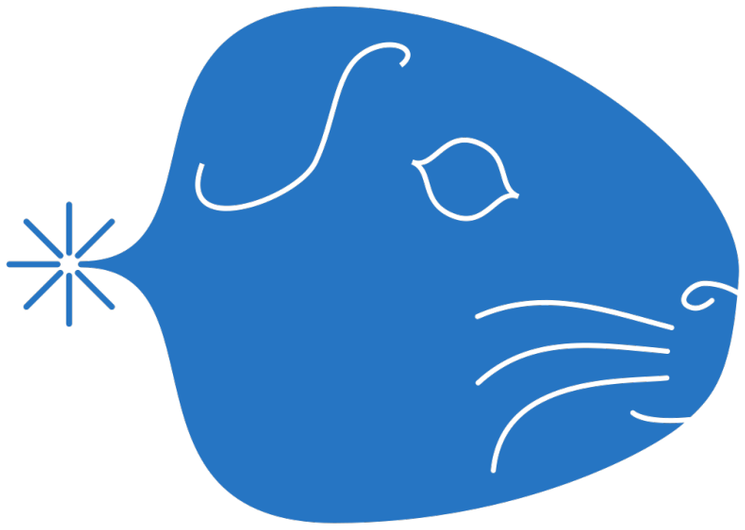

Cobaya in use: Basic and Simple

Originated by Jesus Torrado and Antony Lewis

Presented by PB (Pongsapat Boonaom)
CosCOM 2024

Cobaya : a code for Bayesian analysis in Cosmology

Cobaya is framework for sampling and statistical modelling: it allows you to explore an arbitrary prior or posterior using a range of Monte Carlo samplers. The results of the sampling can be analysed with GetDist. It supports MPI parallelisation.

Language: Python, C, Fortran

Cobaya Structure

Cobaya: is a general purpose statistical framework, it includes interfaces to cosmological theory codes (CAMB and CLASS) and likelihoods of cosmological experiments (Planck, Bicep-Keck, SDSS, etc). Cobaya was partly developed from CosmoMC.

Authors: Jesus Torrado and Antony Lewis

Sampler: Markov Chains Monte-Carlo (MCMC)

Boltzmann Code: CAMB and CLASS

Data: Planck 2018 (TT,TE,EE), Planck lensing, Bicep Keck 18 (2021), BAO (SDSS DR6, DR12, DR16), etc.

Easy to install!

Cobaya Tutorial

1. Summarise Installation
2. Basic Cosmology Run using **CAMB** and **Classy** on **Cobaya**
3. Reproduce plots using **GetDist** (the chains from **CosmoMC**)

Planck 2018 Results. VI. Cosmological parameters

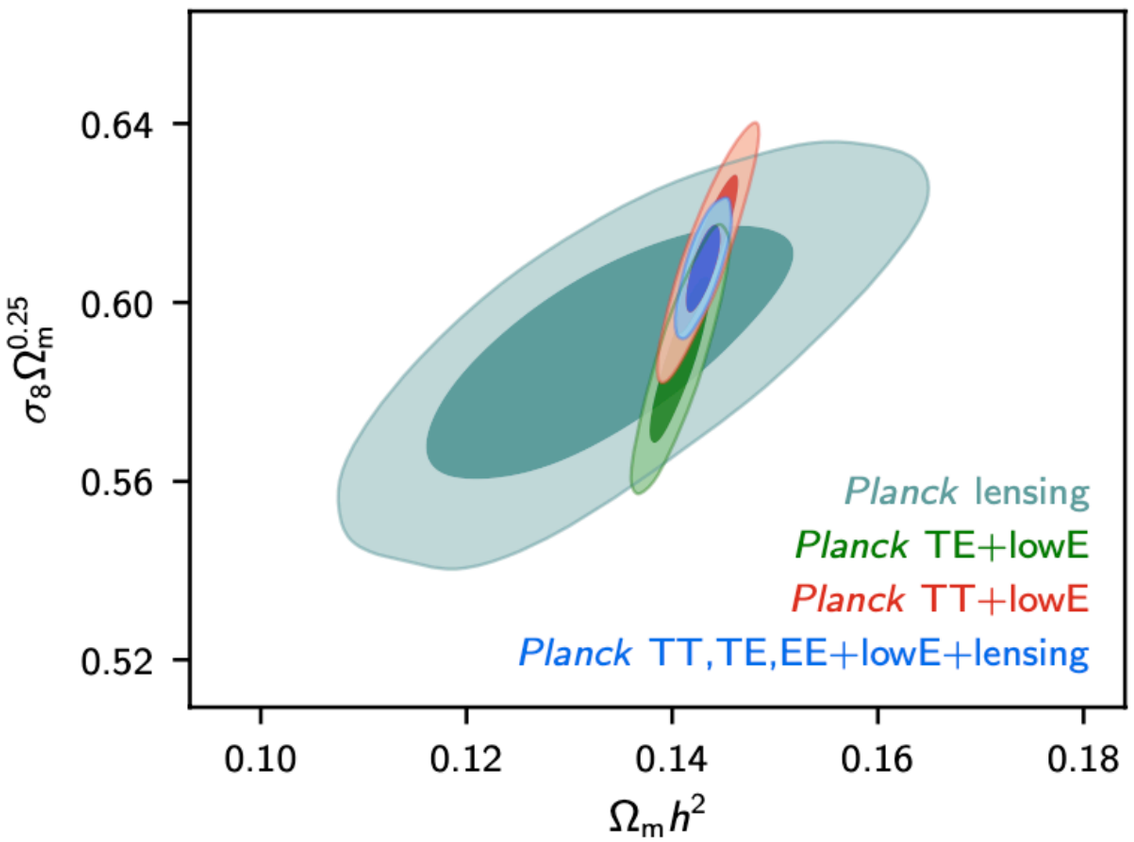

Fig. 6. Base-ΛCDM 68 % and 95 % marginalized constraint contours for the matter density and $\sigma_8\Omega_m^{0.25}$, a fluctuation amplitude parameter that is well constrained by the CMB-lensing likelihood. The *Planck* TE, TT, and lensing likelihoods all overlap in a consistent region of parameter space, with the combined likelihood substantially reducing the allowed parameter space.

Planck 2018 Results. VI. Cosmological parameters

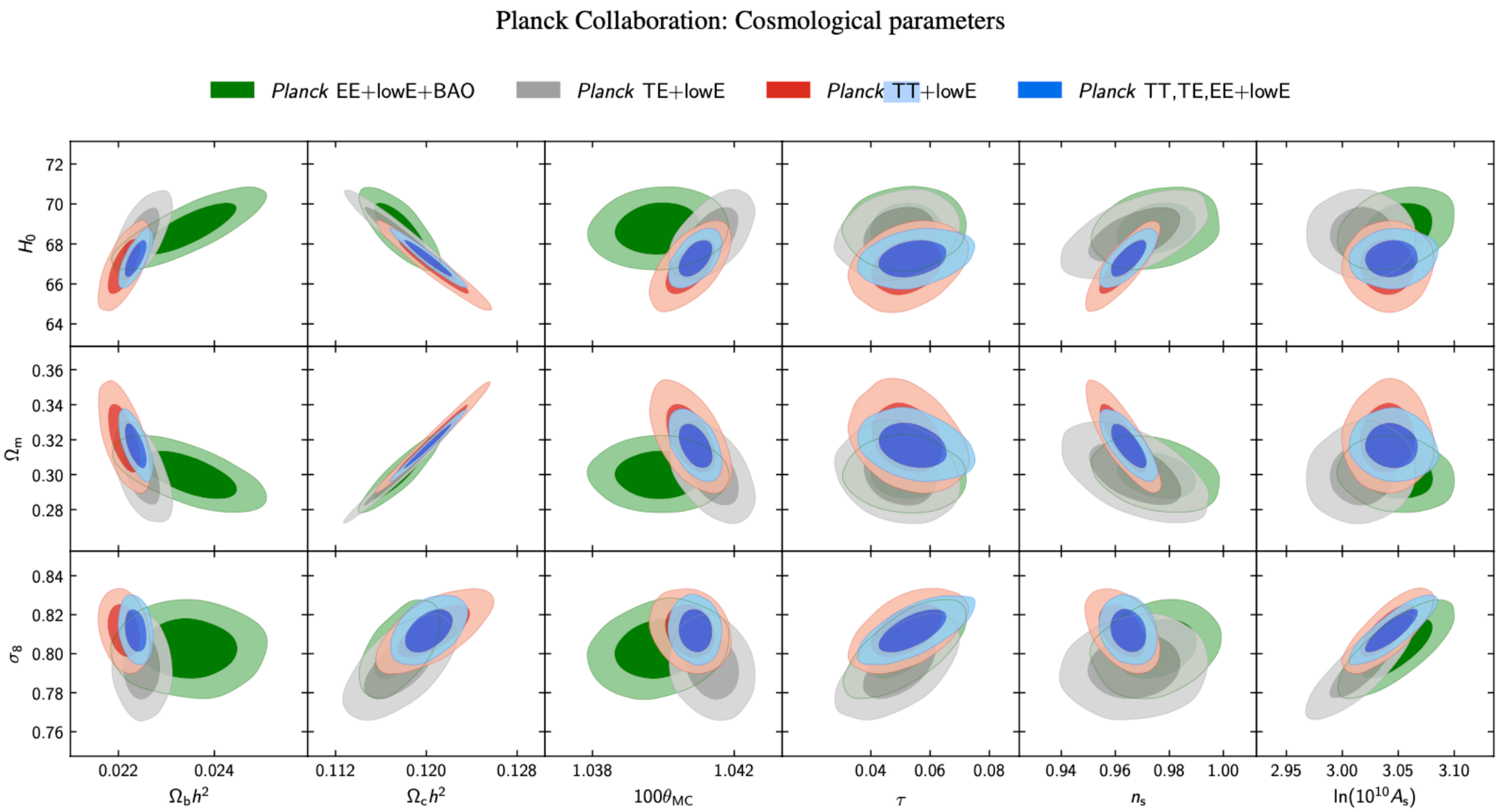

Fig. 5. Constraints on parameters of the base-ΛCDM model from the separate *Planck* EE, TE, and TT high-ℓ spectra combined with low-ℓ polarization (lowE), and, in the case of EE also with BAO (described in Sect. 5.1), compared to the joint result using *Planck* TT,TE,EE+lowE. Parameters on the bottom axis are our sampled MCMC parameters with flat priors, and parameters on the left axis are derived parameters (with H_0 in km s^{-1}Mpc^{-1}). Contours contain 68 % and 95 % of the probability.

Planck 2018 Results. X. Constraints on Inflation

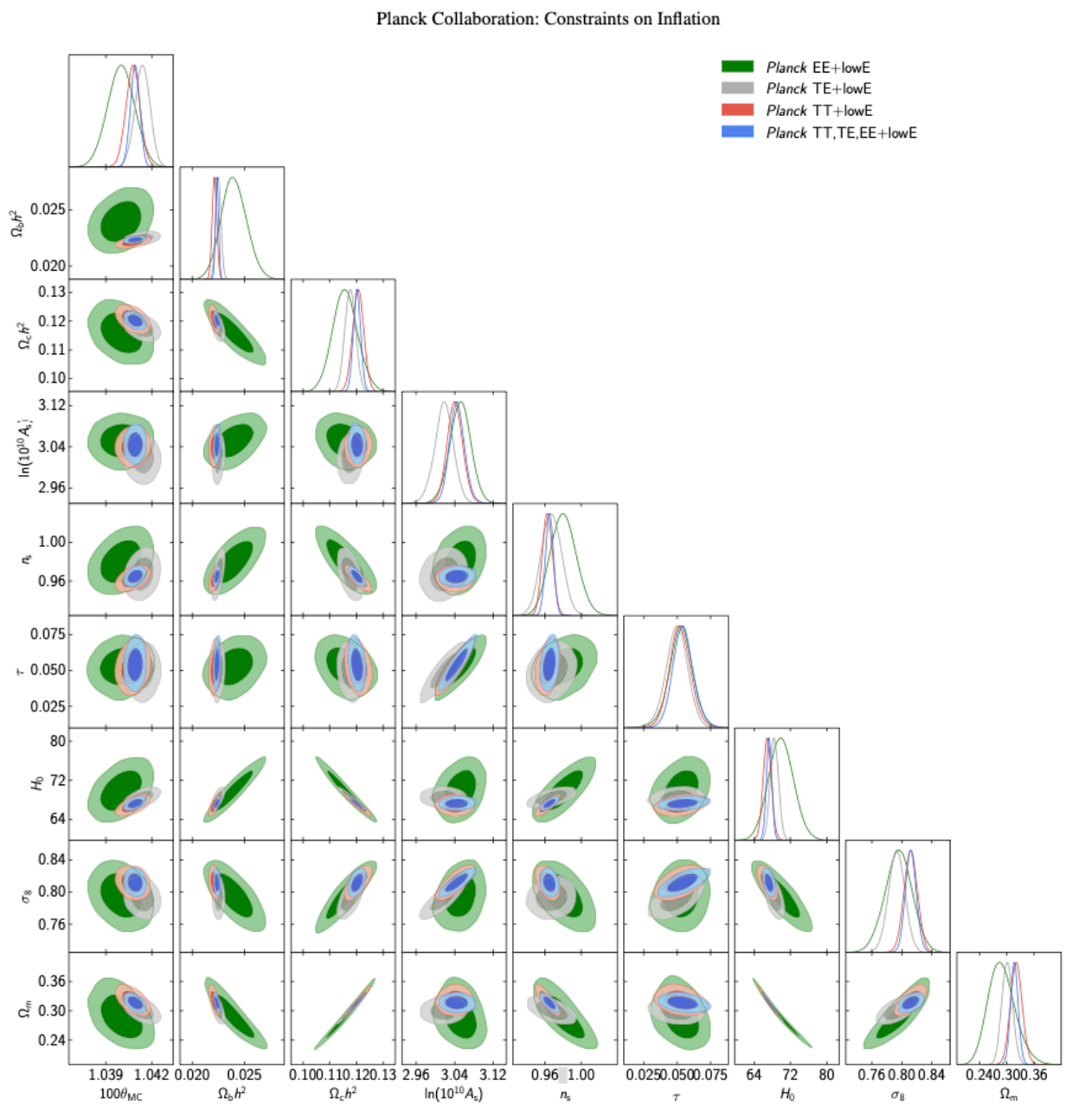

Fig. 2. Marginalized joint 68 % and 95 % CL regions for the cosmological parameters in ΛCDM with *Planck* TT, EE, TE, and joint TT,TE,EE, all in combination with the EE likelihood at low multipoles.