Week 2

Abhiram Sharma

Main Changes

- Added a config file for changing parameters so that the whole code did not have to be manually updated for every new parameter change
- Parallelized code and implemented a workaround for the deepcopy issue

Config File

- Code also checks that the parameters FINESSE targets syntax is valid
- I write this information within the h5 file storing the sampling data so that all the information is contained in one file

```
SAMPLED_PARAMETERS = [
    {
        "name": "ITMX RoC",
        "targets": ["ITMX.Rcx", "ITMX.Rcy"],
        "prior": (1934.9, 1940.9),
        "label": r"$R_{C, ITMX}$ (m)",
        "init_scale": 1e-1,
    },
    {
        "name": "ETMX RoC",
        "targets": ["ETMX.Rcx", "ETMX.Rcy"],
        "prior": (2237.0, 2243.0),
        "label": r"$R_{C, ETMX}$ (m)",
        "init_scale": 1e-1,
    },
    {
        "name": "Laser power",
        "targets": ["L0.P"],
        "prior": (50.0, 70.0),
        "label": r"$P_{laser}$ (W)",
        "init_scale": 0.5,
    },
    {
        "name": "PRM RoC",
        "targets": ["PRM.Rcx", "PRM.Rcy"],
```

Parallelization

- Used emcee's built in handling of pool.

```
ctx = multiprocessing.get_context("fork")

with ctx.Pool(processes=ncores, initializer=init_worker) as pool:
    sampler = emcee.EnsembleSampler(
        nwalkers,
        ndim,
        log_probability,
        args=(y_obs, y_err),
        backend=backend,
        moves=custom_move,
        pool=pool,
    )
```

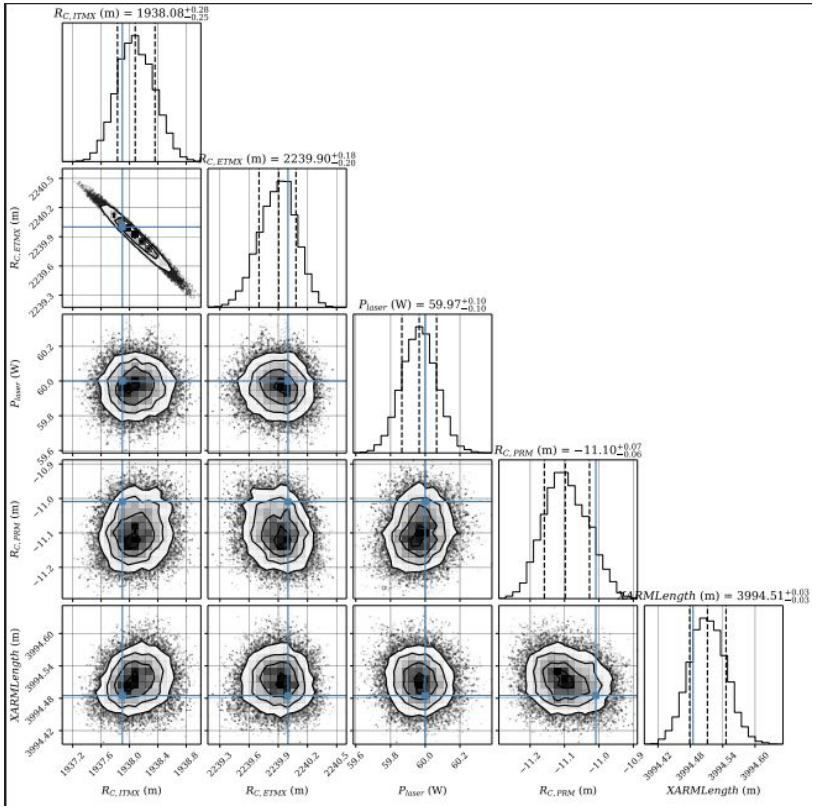
I maintained the speed up from deepcopy by using the init_worker function as an initializer parameter. This makes a deepcopy of the base_model for each thread, then the parameters are changed within the thread itself. This keeps the ~30-40% speedup from not using deepcopy repeatedly for every mcmc step.

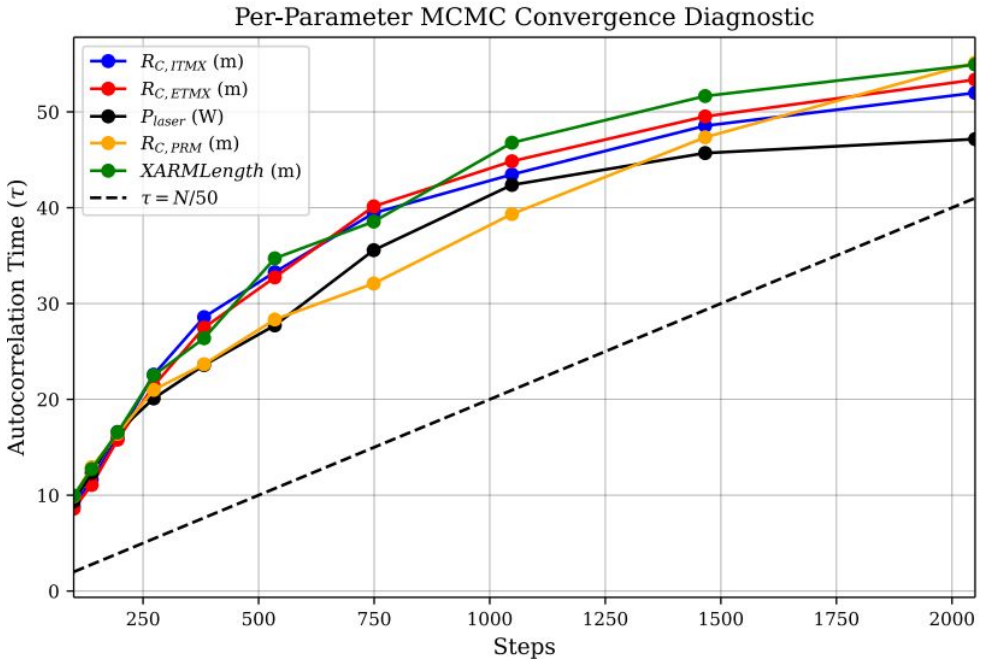
Parallelization

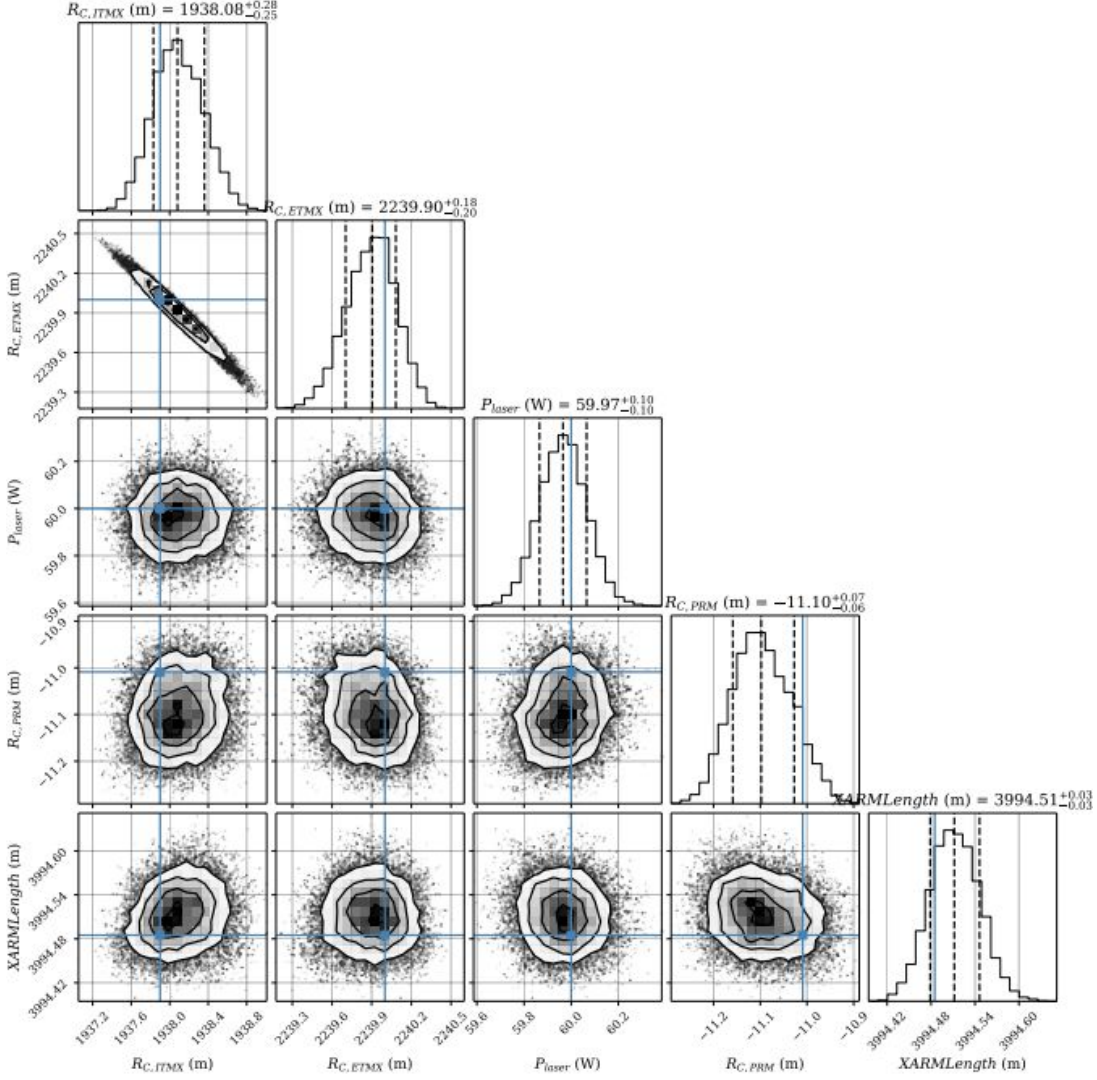
- ~18 s per iteration with 1 core -> ~3s per iteration with 8 cores (chimay)
  - (maxtem = 2)
- ~10 s per iteration with 16 cores (megatron)
  - (maxtem = 8)

Plots

(1% gaussian error on truth values), uninformative uniform priors






$R_{C,ITMX}$ (m) = $1938.08^{+0.28}_{-0.25}$
$R_{C,ETMX}$ (m) = $2239.90^{+0.18}_{-0.20}$
P_{laser} (W) = $59.97^{+0.10}_{-0.10}$
$R_{C,PRM}$ (m) = $-11.10^{+0.07}_{-0.06}$
$XARMLength$ (m) = $3994.51^{+0.03}_{-0.03}$
$R_{C,ITMX}$ (m)
$R_{C,ETMX}$ (m)
P_{laser} (W)
$R_{C,PRM}$ (m)
$XARMLength$ (m)