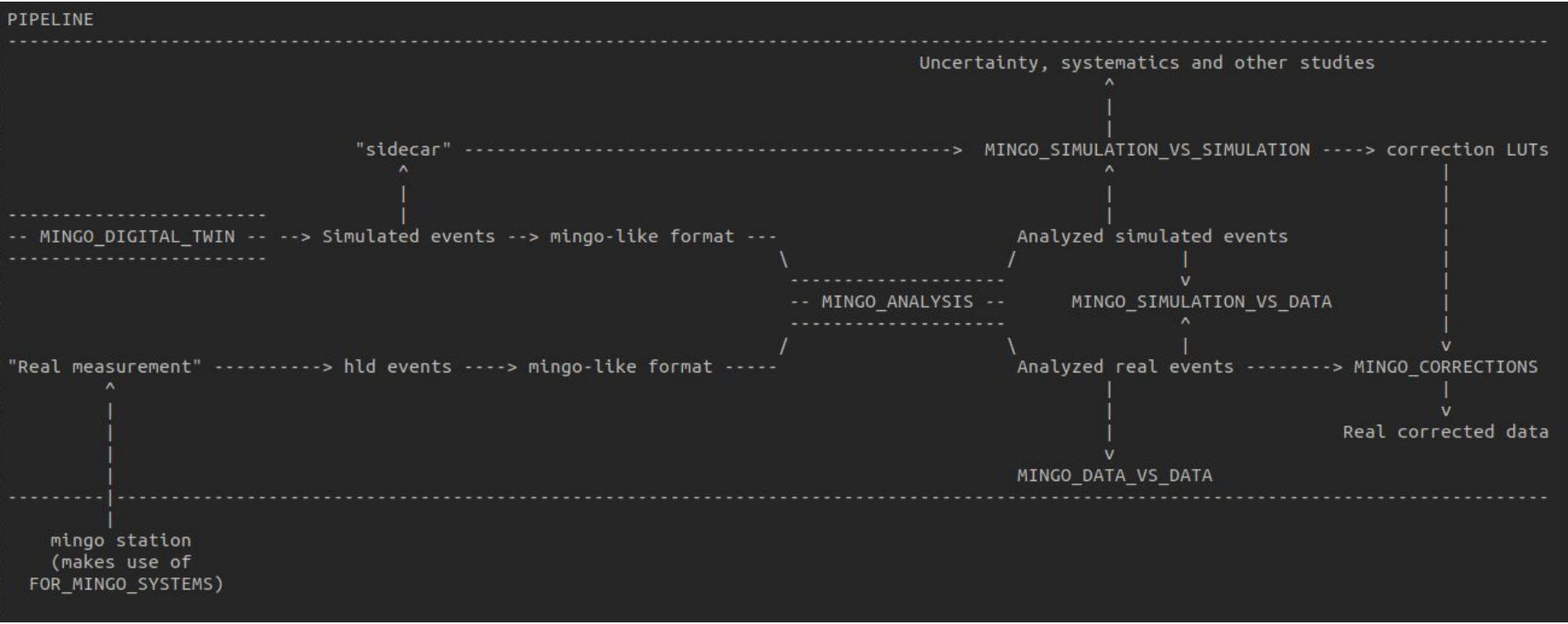
RPC group Meeting

miniTRASGO analysis and simulation pipeline

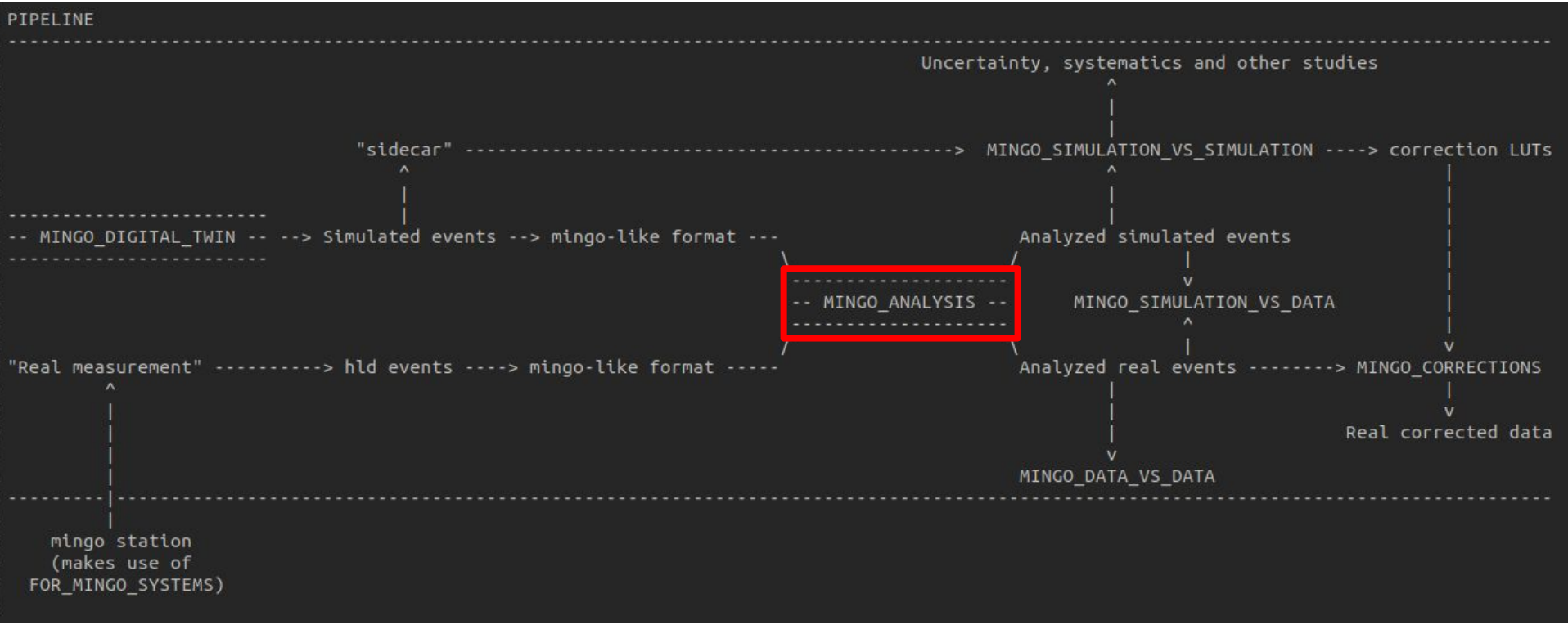
2026/11/12

C. Soneira Landín

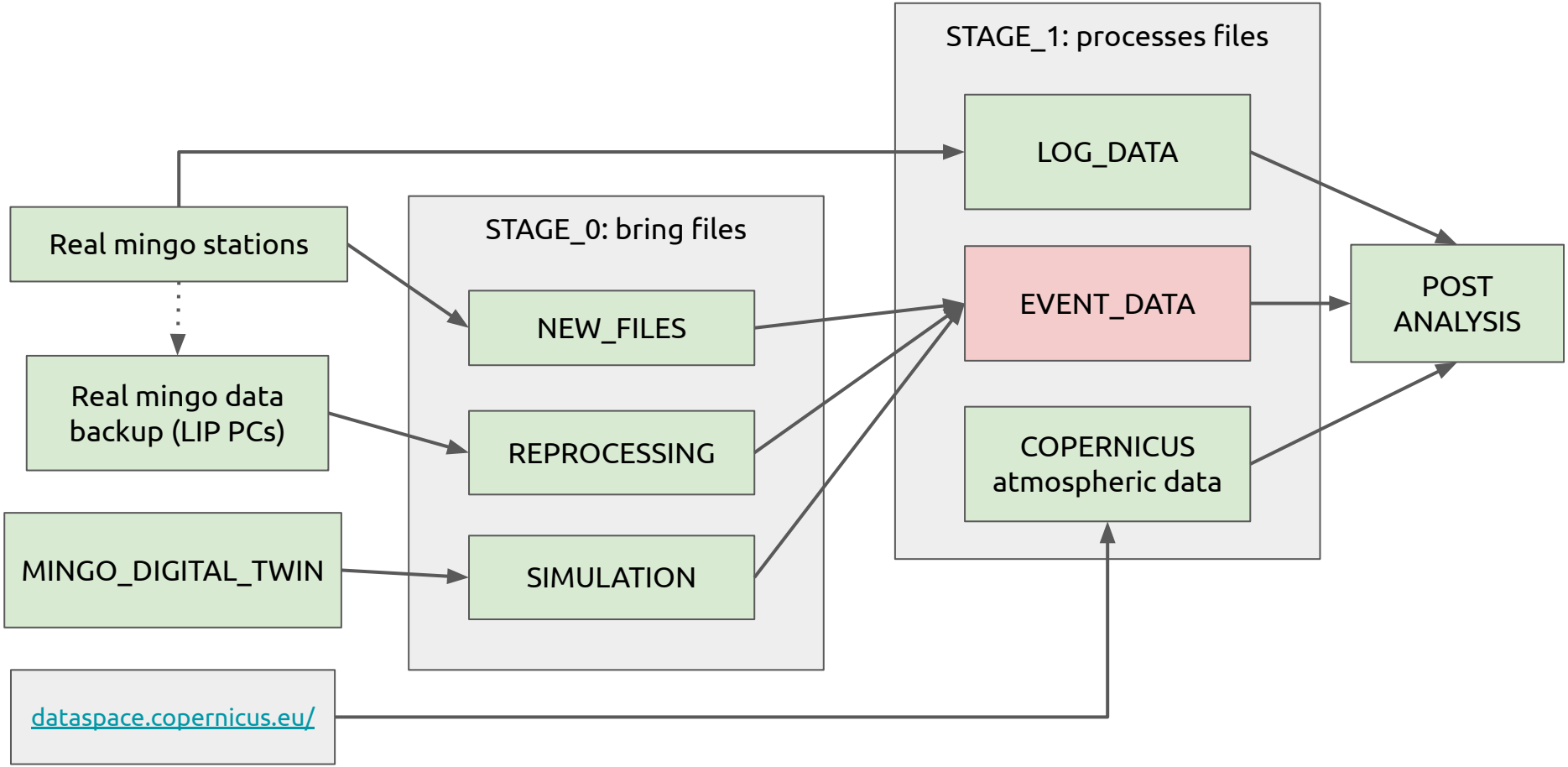
What does github.com/csoneira/mingo-computing contain?

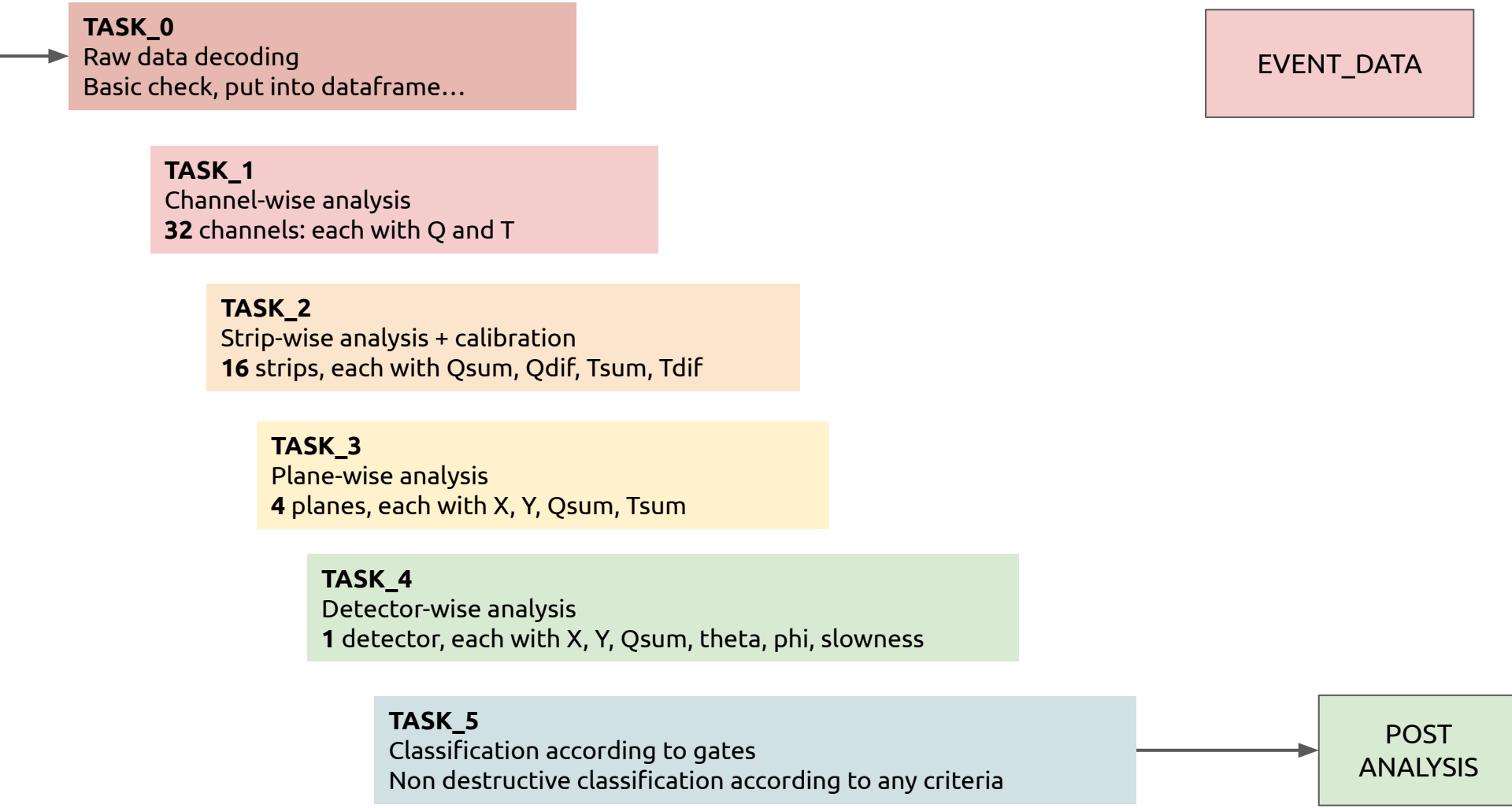


What does github.com/csoneira/mingo-computing contain?

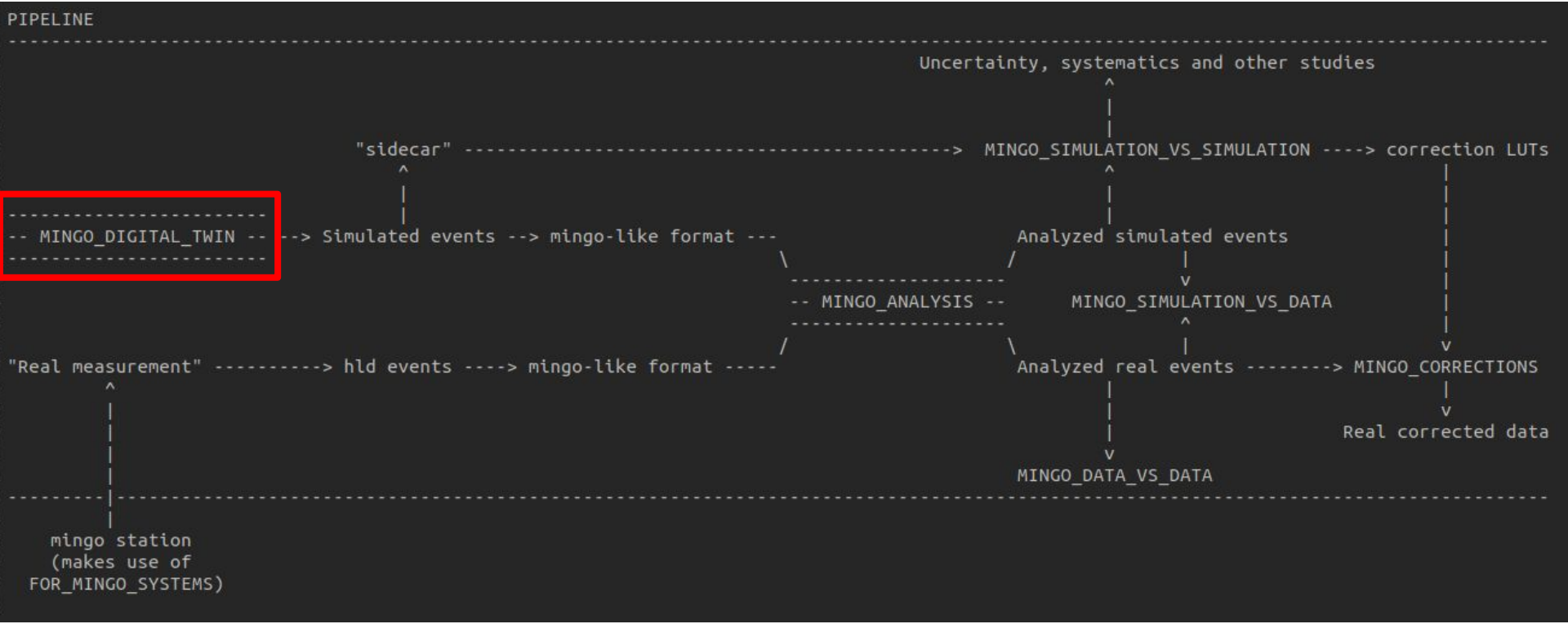


MINGO_ANALYSIS




TASK_0
Raw data decoding
Basic check, put into dataframe…
EVENT_DATA
TASK_1
Channel-wise analysis
32 channels: each with Q and T
TASK_2
Strip-wise analysis + calibration
16 strips, each with Qsum, Qdif, Tsum, Tdif
TASK_3
Plane-wise analysis
4 planes, each with X, Y, Qsum, Tsum
TASK_4
Detector-wise analysis
1 detector, each with X, Y, Qsum, theta, phi, slowness
TASK_5
Classification according to gates
Non destructive classification according to any criteria
POST ANALYSIS

What does github.com/csoneira/mingo-computing contain?



PARTICLE GENERATION AND DETECTION

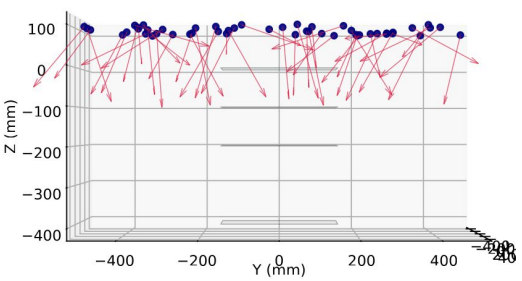
STEP 0 – Simulation configuration
Muon flux: 0.5–2.5 cm^{-2} min^{-1}
RPC efficiency: 50–100%
Angular distribution: $\cos^n\theta$
Detector geometry

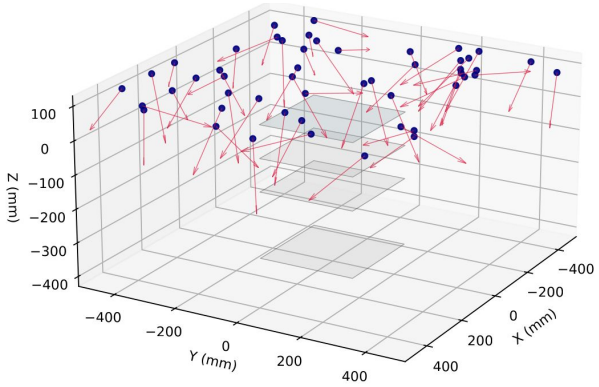
STEP 1 – Muon generation
Position (x, y, z), direction (θ, φ), arrival time
Generation area: 2500 × 2500 mm^2

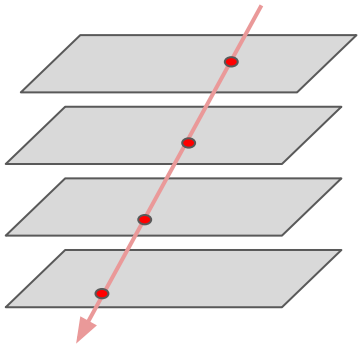
STEP 2 – Muon crossing
Muon intersections with RPC planes

STEP 3 – Ionization and avalanche model
Gas gap: 3 mm
Townsend coefficient: 4.836 mm^{-1}
Simplified model; efficiency enters here

Φ, n $(\varepsilon_1, \varepsilon_2, \varepsilon_3, \varepsilon_4)$ (z_1, z_2, z_3, z_4)





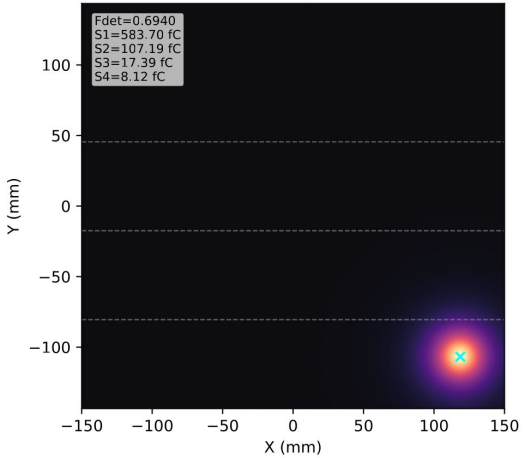


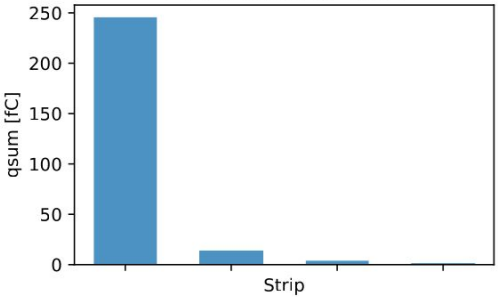
SIGNAL FORMATION AND PROPAGATION

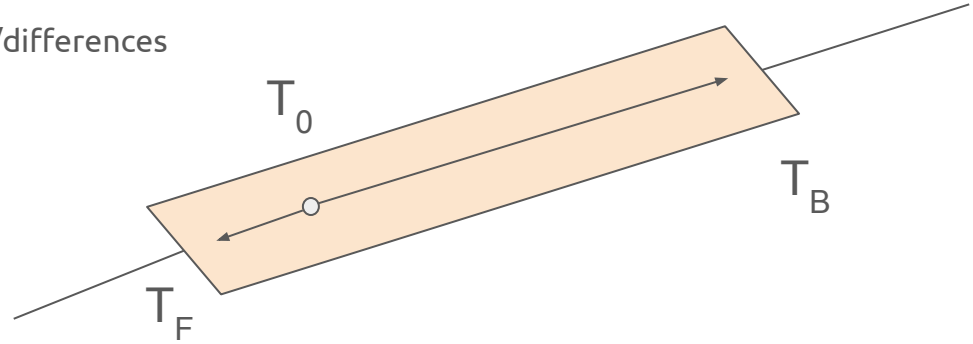
STEP 4 – Signal induction
Induced charge fraction: 60%
Charge spread (Lorentzian): γ = 4.73 mm
Spatial uncertainty: σ_x = 10 mm
Time uncertainty: σ□ = 0.5 ns
Strip geometry: 4 strips/plane

STEP 5 – Signal propagation
Time difference between strip ends
Propagation speed: ≈ 200 mm/ns
Charge asymmetry fluctuations: σ = 0.01

STEP 6 – Channel signals
Front/back arrival times and charges
Calculated from time and charge sums/differences
No additional parameters







ELECTRONICS AND DATA ACQUISITION

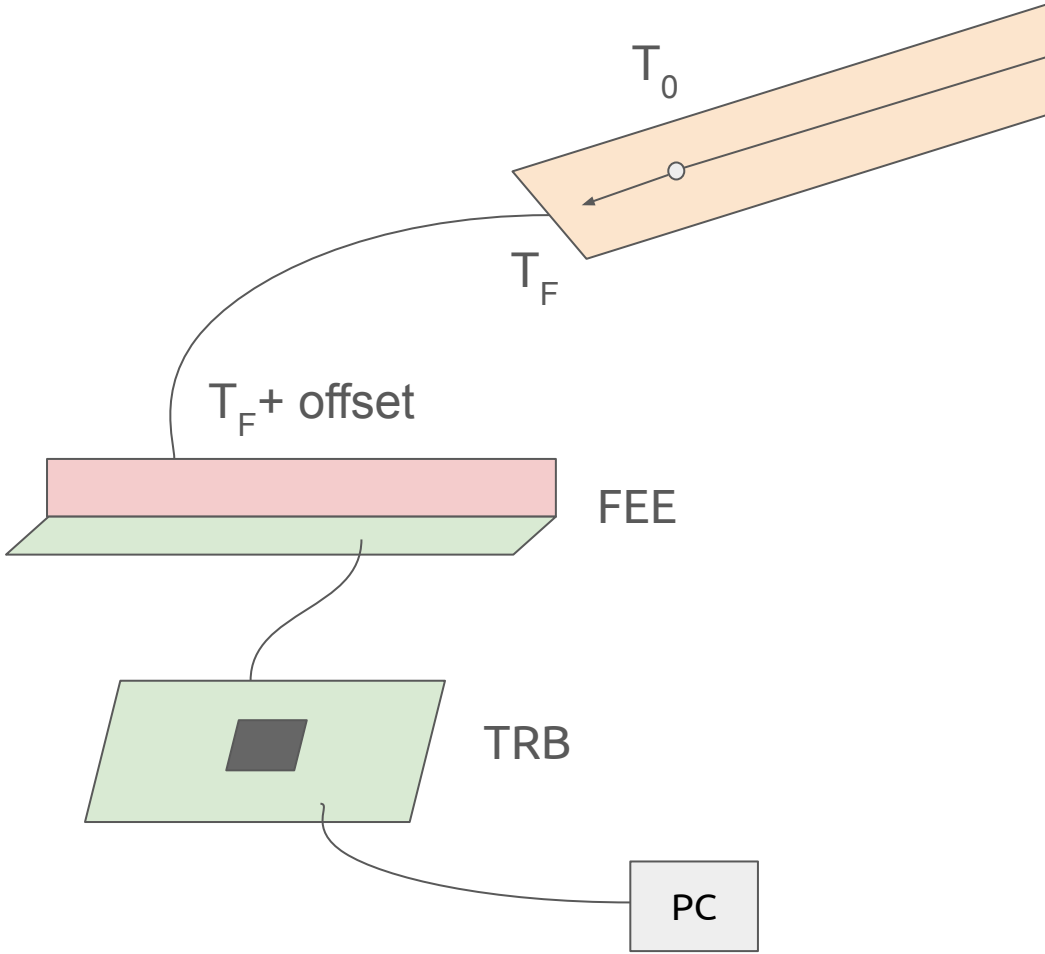
STEP 7 – Channel timing offsets
Individual front/back timing offsets
Configured separately for each strip and plane

STEP 8 – Front-end electronics
Timing noise: σ□ = 30 ps
ToT noise: σ = 0.4 ns
Discriminator threshold: ≈ 60 fC (0.13792 ns ToT)
Charge-to-ToT calibration
Channel-dependent charge offsets

STEP 9 – TRB Trigger logic
RPC coincidence combinations: 12, 23, 34, 13
Station-dependent trigger configuration

STEP 10 – TRB time assignation
TDC resolution: σ = 16 ps
DAQ jitter: uniform, 10 ns width

STEP FINAL – Data output
MINGO-compatible .dat files
Timestamps and simulation metadata

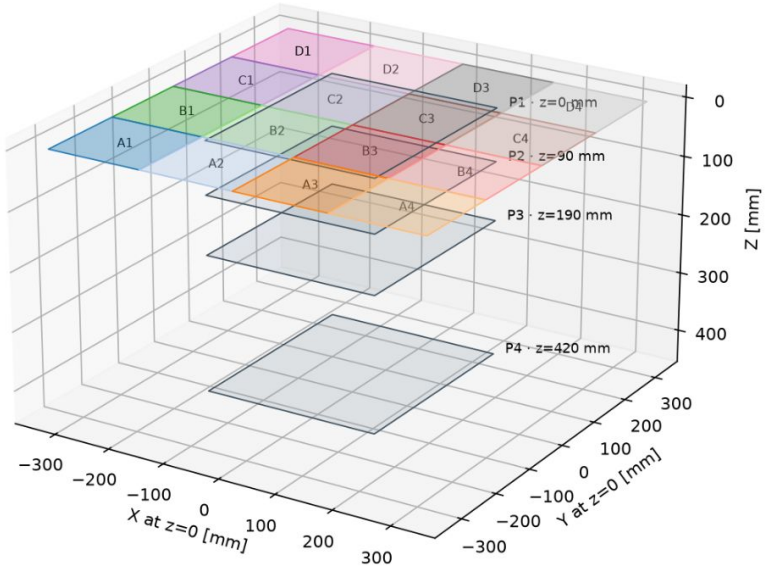


Result: identical mingo shape, except for a header with a hash identifying the simulation run

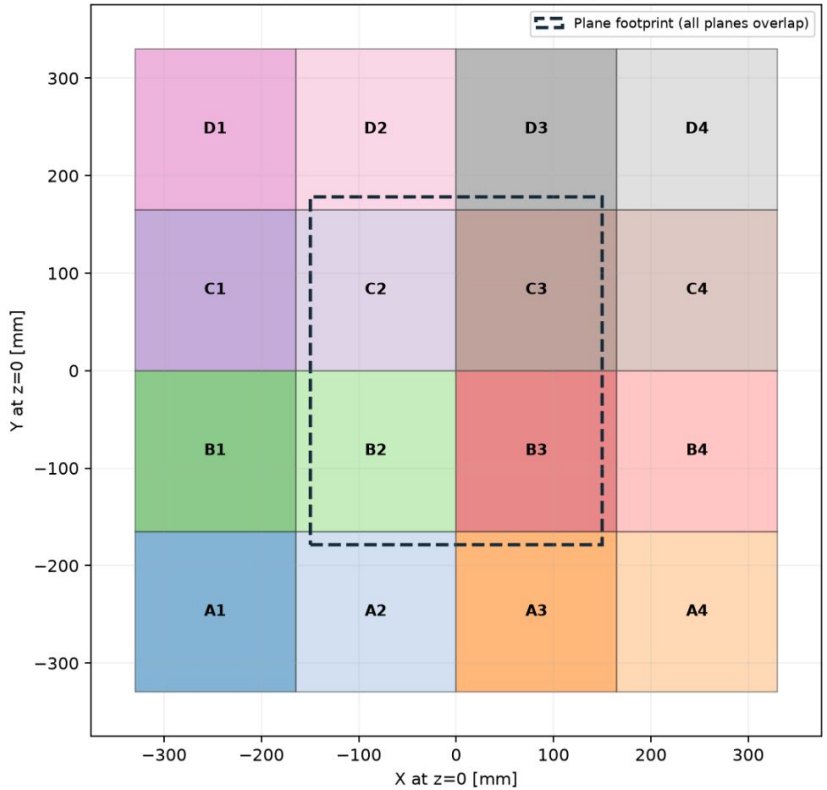
```
# param_hash=fc91e38f2b3f4685dbe44904993a91a463dc973888a7698c62033779da8fc299
2007 09 22 00 00 00 1 -127.9945 -125.5281 -123.3145 -120.3701 -126.5988 -126.0003 -124.6293 -122.8974 0115.4559
2007 09 22 00 00 00 1 0000.0000 0000.0000 0000.0000 0000.0000 0000.0000 0000.0000 0000.0000 0000.0000 0000.0000
2007 09 22 00 00 00 1 -123.1623 -121.6232 -119.2521 -117.3444 -122.3731 -122.7464 -121.5572 -120.6383 0098.2461
2007 09 22 00 00 00 1 0000.0000 0000.0000 0000.0000 0000.0000 0000.0000 0000.0000 0000.0000 0000.0000 0000.0000
2007 09 22 00 00 01 1 0000.0000 0000.0000 0000.0000 0000.0000 0000.0000 0000.0000 0000.0000 0000.0000 0000.0000
2007 09 22 00 00 01 1 0000.0000 0000.0000 0000.0000 0000.0000 0000.0000 0000.0000 0000.0000 0000.0000 0000.0000
2007 09 22 00 00 01 1 0000.0000 0000.0000 0000.0000 0000.0000 0000.0000 0000.0000 0000.0000 0000.0000 0000.0000
2007 09 22 00 00 01 1 0000.0000 0000.0000 0000.0000 0000.0000 0000.0000 0000.0000 0000.0000 0000.0000 0000.0000
2007 09 22 00 00 01 1 0000.0000 0000.0000 0000.0000 0000.0000 0000.0000 0000.0000 0000.0000 0000.0000 0000.0000
```

Shared tracker map: fixed 4 × 4 x/y regions for every trigger and gate

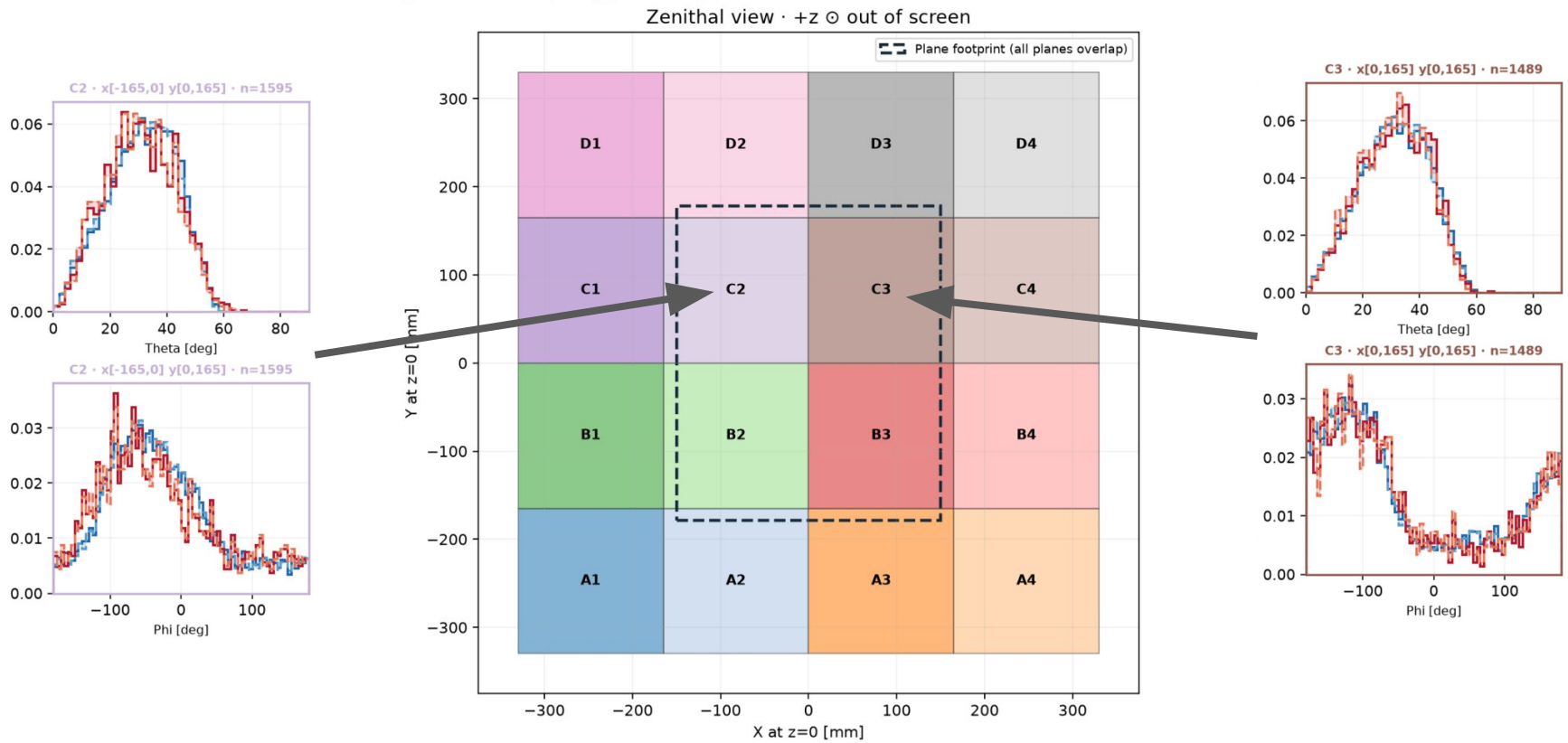
Tracker perspective · +z follows particle direction



Zenithal view · +z ⊙ out of screen



For example: events with planes 1, 2 and 3 (upper most)



For example: events with planes 1, 2 and 3 (upper most)

