EMRIs in the DDPC structure

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Workshop EMRIs in LISA GF Part I, APC-Paris, 23-26 June

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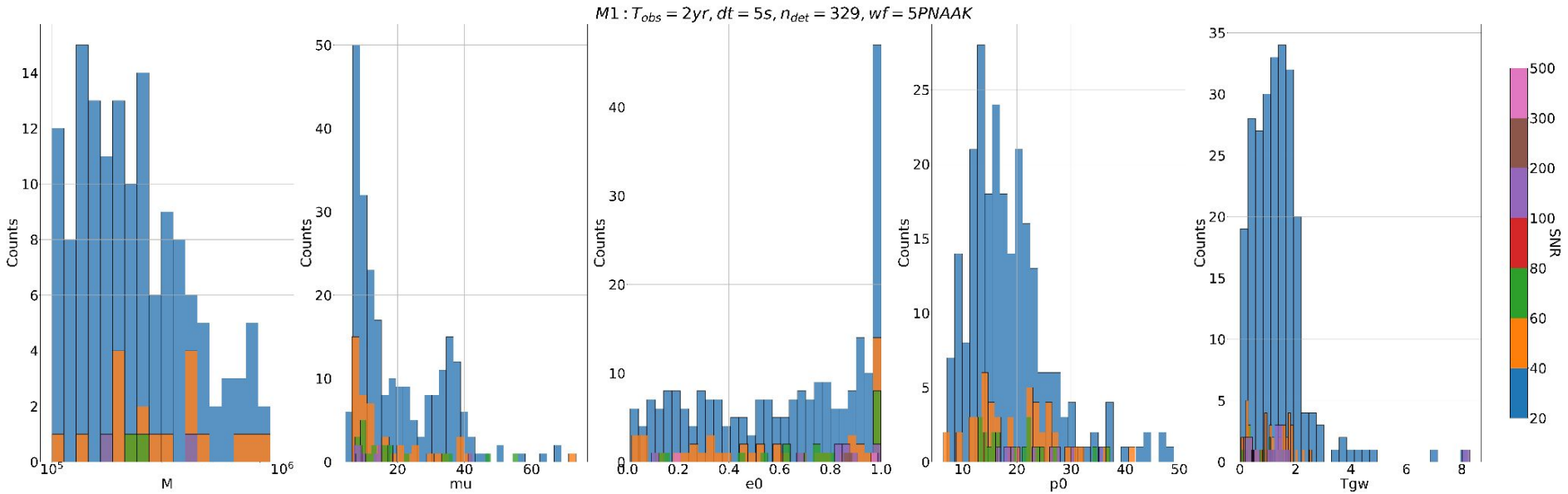
Lite Mojito Dataset

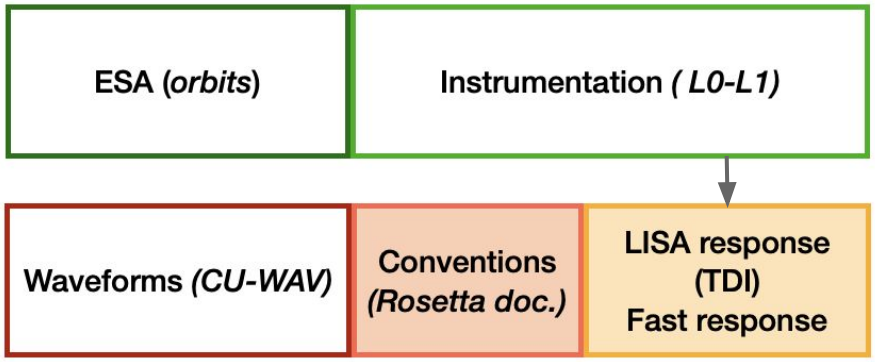
- 2 year duration at 0.2 Hz cadence
- ESA orbits → unequal and flexing armlength
- Sources → LEGO type:
  - GB (1e7 → SGWB)
  - extra GB (~10)
  - MBHB without precession (~20 sources)
  - sBHB (~ 8 sources)
  - EMRI (~ 8 sources)
  - No gaps or glitches

EMRIs in Lite Mojito Dataset

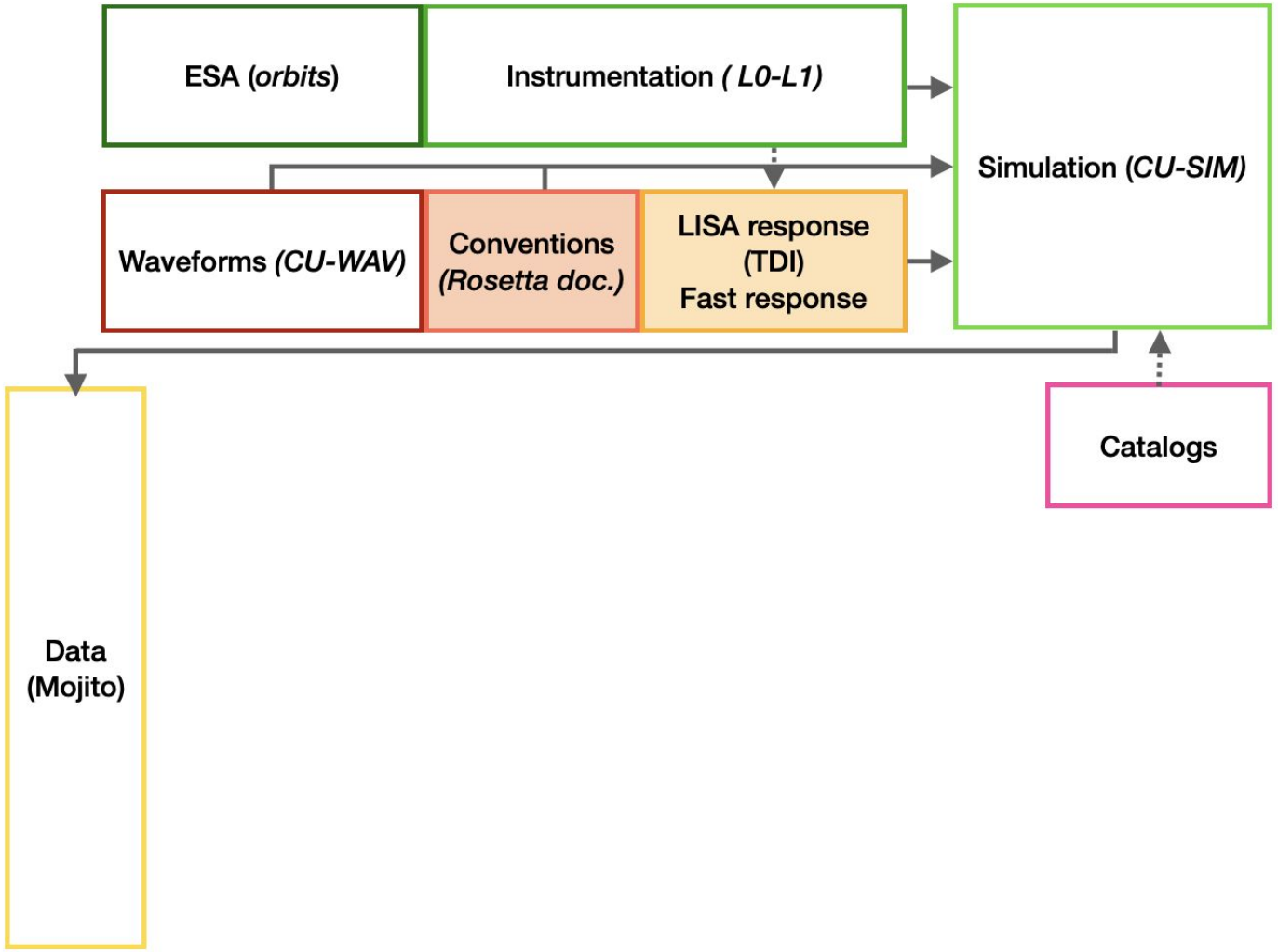
- Kerr Eccentric Equatorial waveform model
- Primary masses [1e5 - 1e7] Msun
- Mass ratio q ~ [1e-6 - 2e-4]
- Wide range of eccentricities [0 , 0.8]
- 6 Plunging + 2 not plunging systems
- SNR > 30



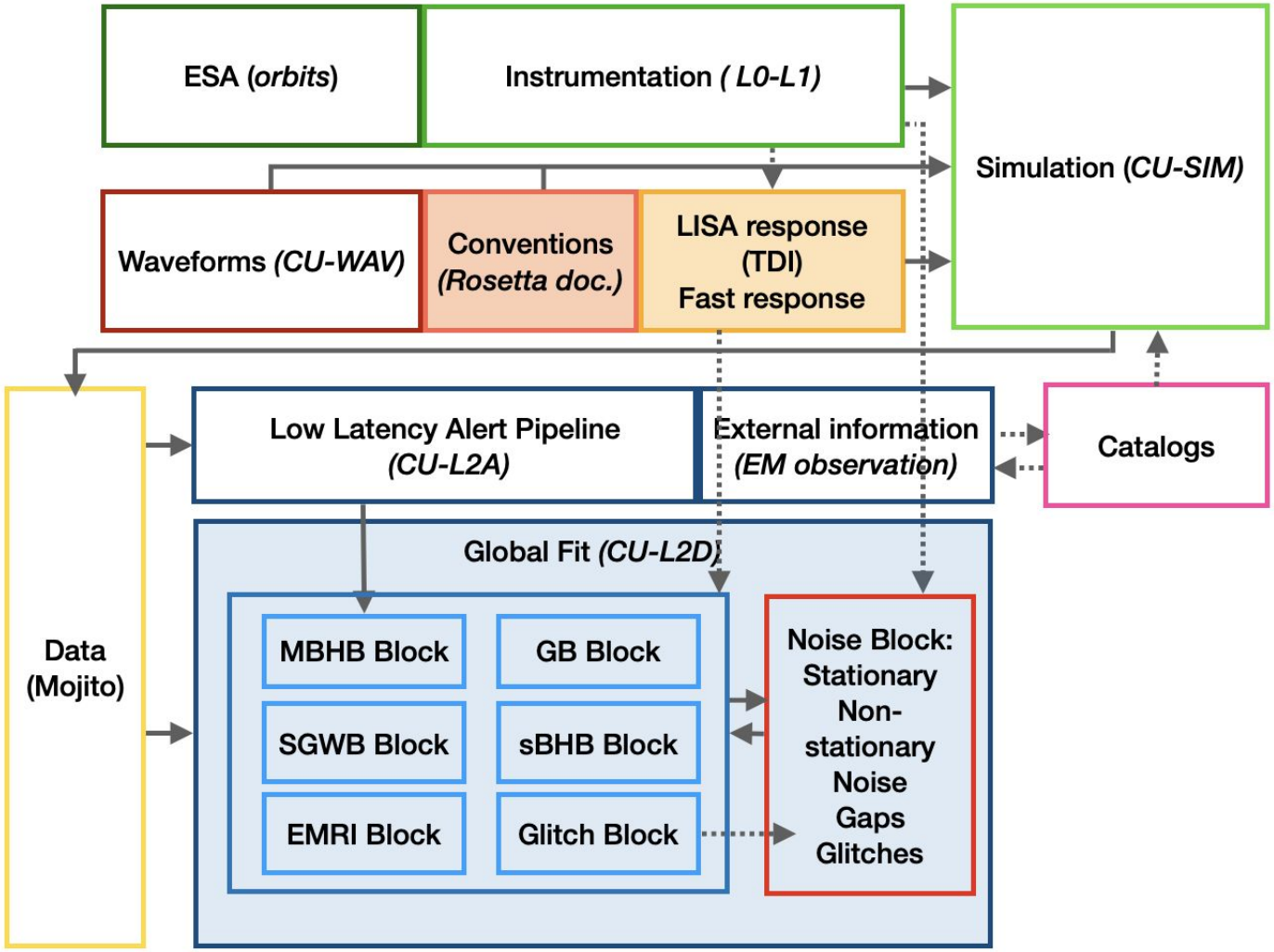
DDPC structure



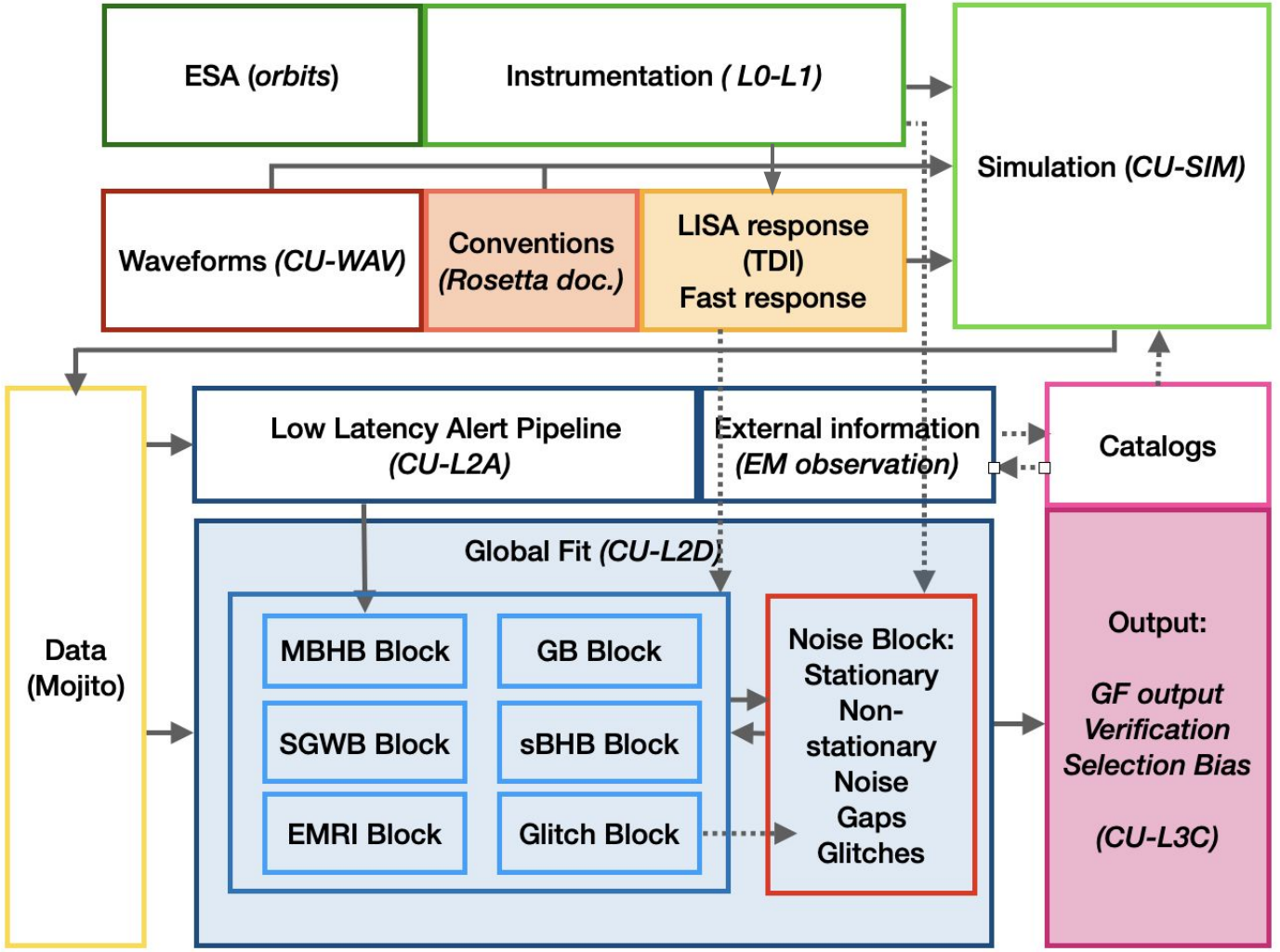
DDPC structure



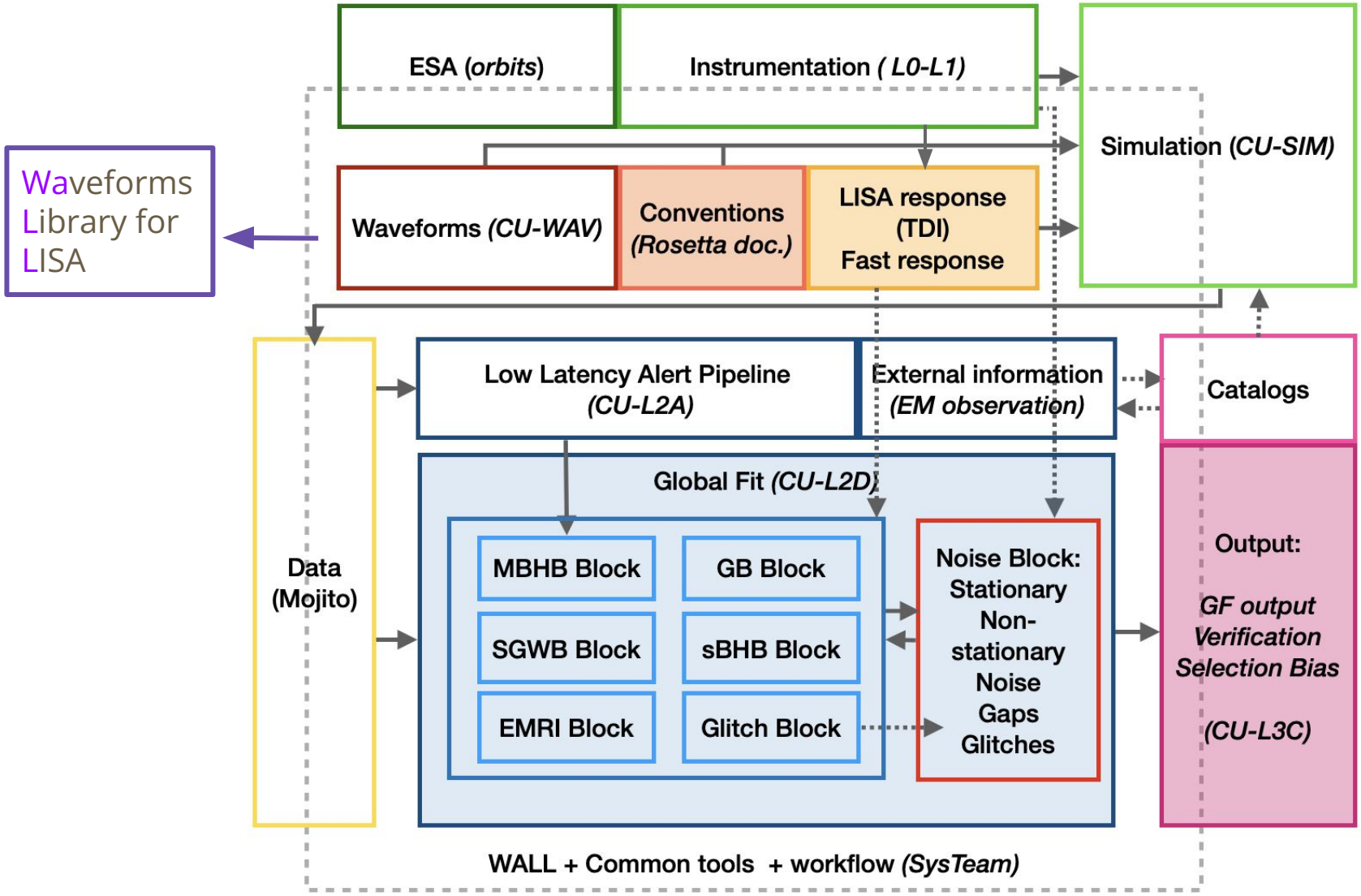
DDPC structure



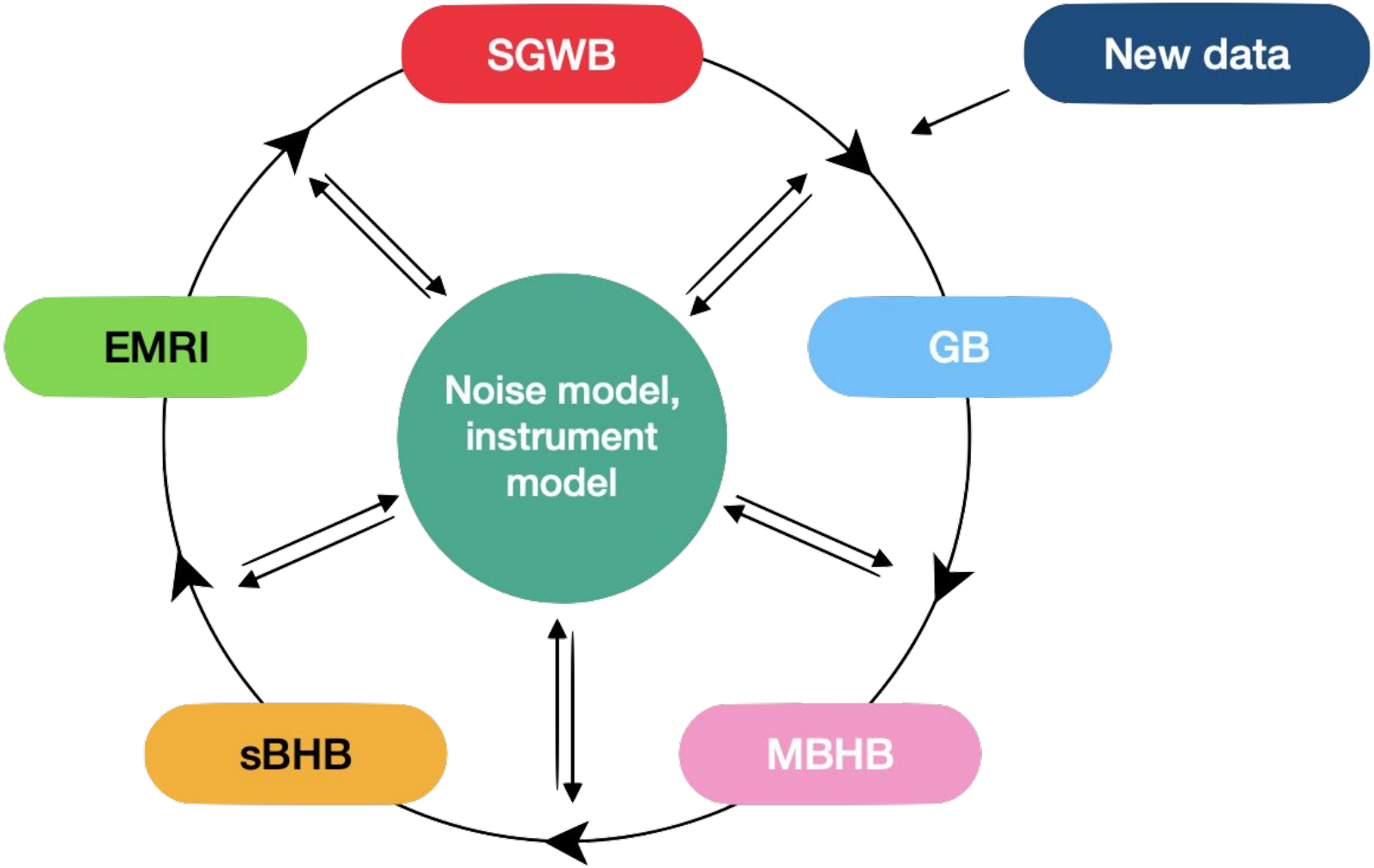
DDPC structure



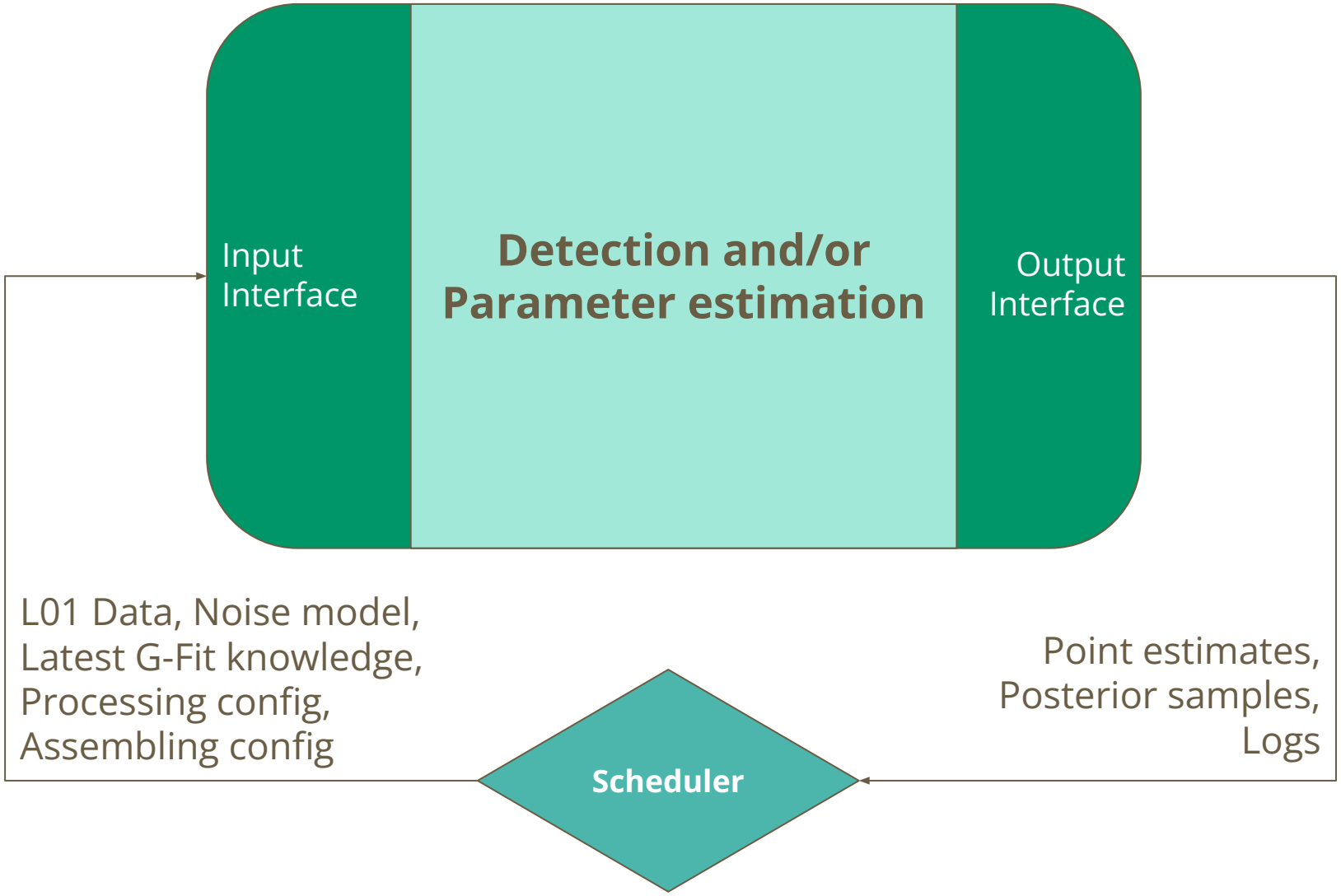
DDPC structure



L2D & the Global Fit



GW Source Block



GW Source Block

Detection and/or Parameter estimation

Detection:

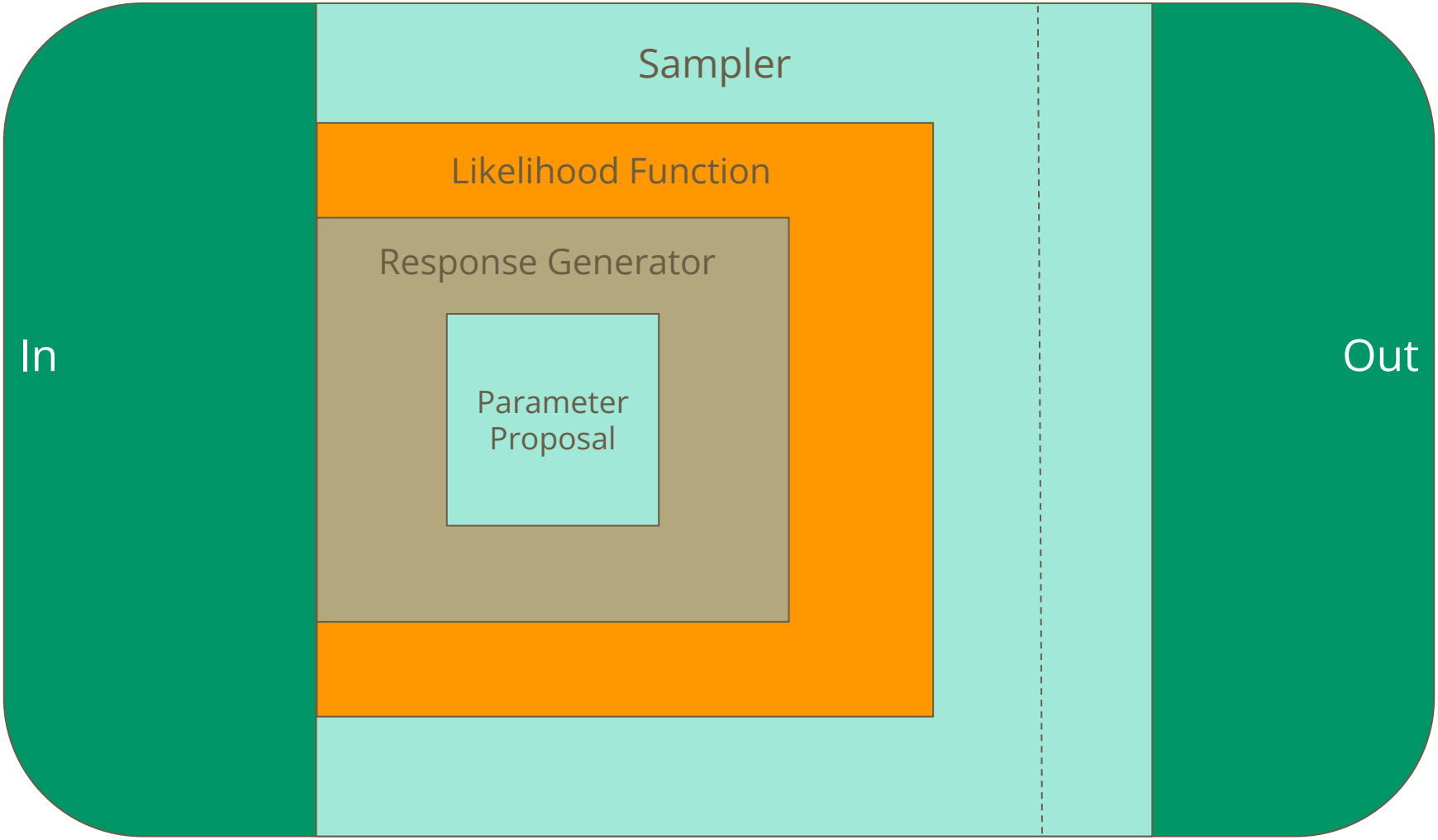
- Detection statistic
- SBI
- ...

PE:

- MCMC
- SBI
- ...

In any case we need the waveform

GW Source Block Anatomy (if likelihood-based PE)



EMRI Block Interfaces (if likelihood-based PE)

- Response Generator
  - FEW, ...
  - If desirable, split into Response & Waveform Gen (H+, Hx, H_lmkn)
  - **Constructor interface** Processed L01 data metadata, Optional Auxiliary
  - **Interface-IN** array of parameter struct
  - **Interface-OUT** waveform representation
- Likelihood Function
  - **Constructor interface** Processed L01 data, Noise model, Optional Auxiliary
  - **Interface-IN** waveform representation
  - **Interface-OUT** array of number
- Sampler
  - **Constructor interface** Prior distribution, Proposal strategy, Composition of LF and RG, Optional Auxiliary

EMRI Block Interfaces (if likelihood-based PE)

- Analogy
  - Response Generator ⇔ Pianist
    - Parameter struct ⇔ Music score
  - Likelihood Function ⇔ Piano
    - Processed L01 data ⇔ String
    - Noise model ⇔ Tuning
- Towards common interfaces
  - All constructed EMRI RGs produce waveform representations in the same format ⇔ Keyboard configuration
  - All constructed EMRI LFs consume waveform representations in that format
  - All EMRI RGs, LFs & Samplers are constructed via the block input interface
  - Write wrappers to adapt existing RGs/LFs if easy

Towards Common Tools/Interfaces within L2D

- L2D subgroups (common tools, EMRI, MBHB, GB, ...)
- Differences between common tools and common interfaces
  - Common Tools: avoid reinventing the wheels, reuse codes, nice to have
    - Examples: Heterodyned LF, Noise model estimator, Prior distribution transformers, Eryn, Pygmo, ...
  - Common Interfaces: allow communication between different parts, vital to have
    - Examples: Waveform representation format, Parameter struct format, Noise model IO interface
    - How it behaves >> what it is
- Common tools are not really common without common interfaces