

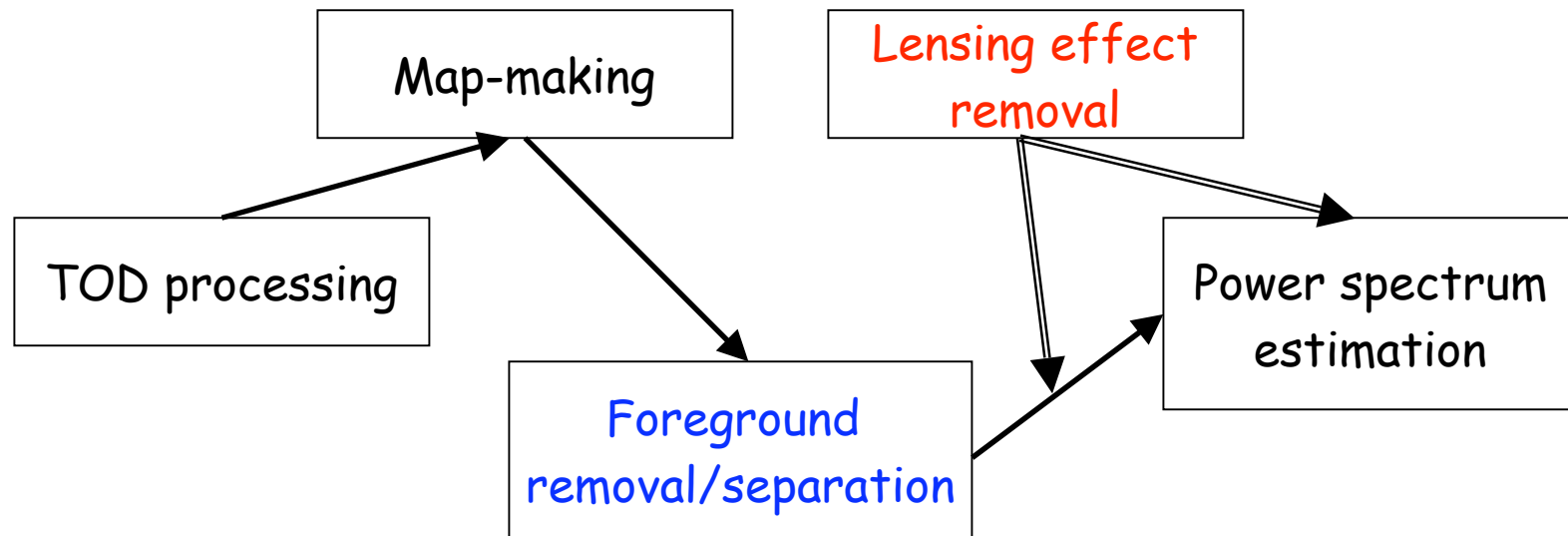


Bpol data analysis: preliminaries

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CMB data analysis pipeline



Feasibility:

- Data sizes: N_f and N_{pix} ;
- Algorithm efficiency and accuracy (biases);
- Experiment characteristic;
- Departures from the linear pipeline;
- Time or pixel domain based Monte Carlos/simulations;
- Available computer power (cycles, I/O bandwidth, data storage, memory, etc).



Bpol data set (1)



- In time domain:
 - detector sensitivity: $100 \mu\text{K rt}(\text{sec})$
 - required map noise level: $5 \mu\text{K.arcmin}$ for the "CMB" channel
⇒ 10,000 years of total integration (uniform sky coverage);
 - observation time: 2years
⇒ # of detectors: 5,000
 - sampling rate: 10 msec
⇒ 5×10^{13} per frequency channel and 10^{14} total samples
(10^2 - 10^3 times larger than the anticipated Planck data set);
 - Required storage: a few Petabytes (just for the detector readouts and compressed pointing info).



Bpol data set (2)



- In pixel domain:
 - 30' : $N_{\text{pix}} = 10^5$ per Stokes parameter per frequency channel;
 - 8' : $N_{\text{pix}} = 10^6$ per Stokes parameter per frequency channel;
 - 2' : $N_{\text{pix}} = 10^8$ per Stokes parameter per frequency channel;
- Complexity:
 - multiple detectors (technologies ?!);
 - multiple frequency;
 - multiple modulations on a number of levels;
 - sophisticated optical system.

● .



Data analysis cost: Planck-HFI example



- $O(10)$ ExaFlops total;
- $O(1)$ Tflop/sec day-to-day processing power;
- $O(100)$ Tflop/sec at the peak for some of the heaviest tasks;
- $O(1-10)$ Tbytes total memory;
- $O(100-1000)$ Tbytes total disc space.
- .

PetaFlop computer for Bpol ?!



What's difficult to correct for ?



- Beam effects: asymmetries, side-lobes, bolo (integration) constants;
- Poor/inhomogeneous pixel sampling down to sub-pixel scale;
- Control I \rightarrow Q, U leakage.

What DA could wish for ?

- Simple (manageable) noise in pixel domain.