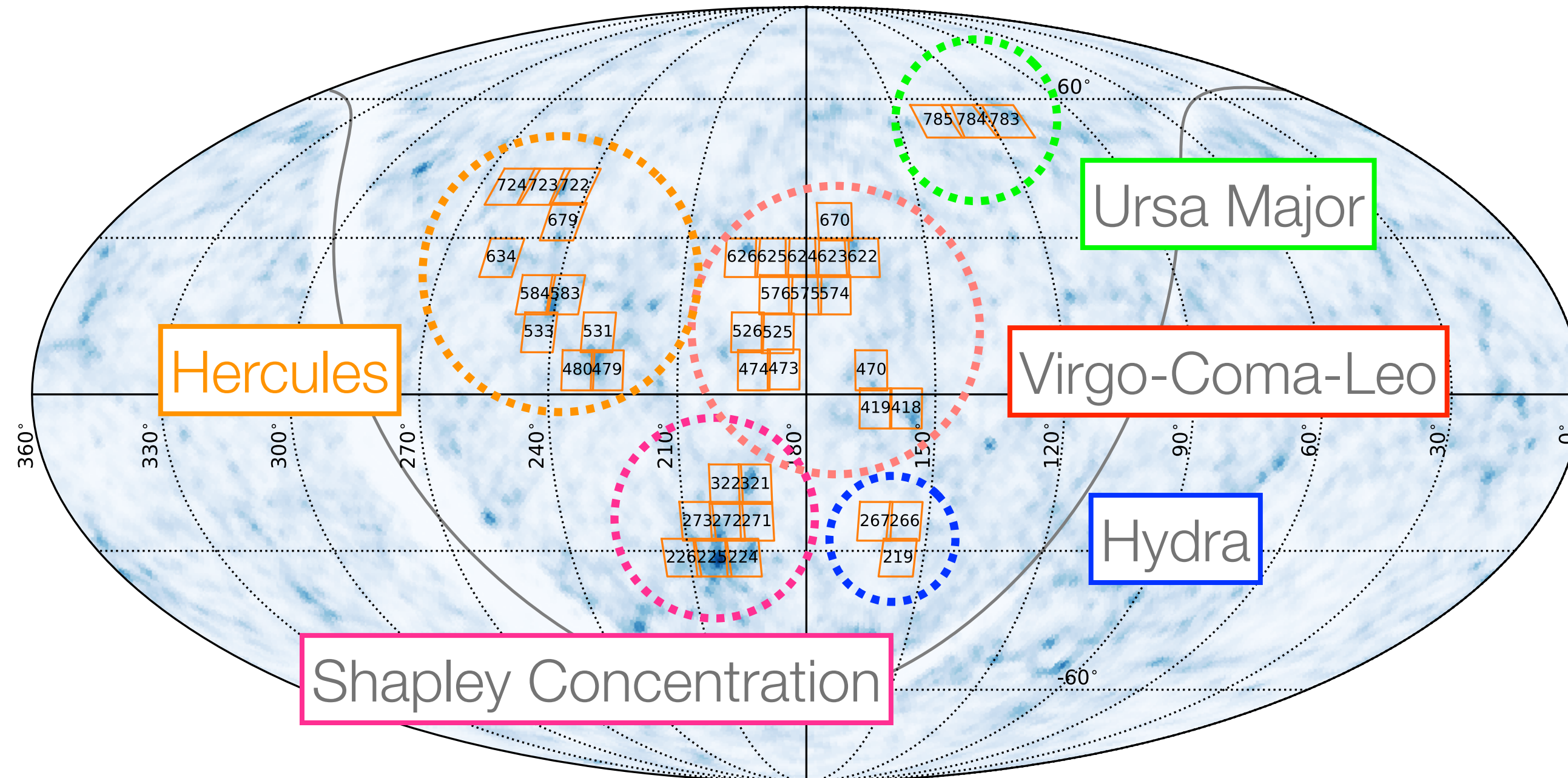


April Experiment: Uncovering faint optical transients in nearby galaxy clusters

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Motivation and experiment design

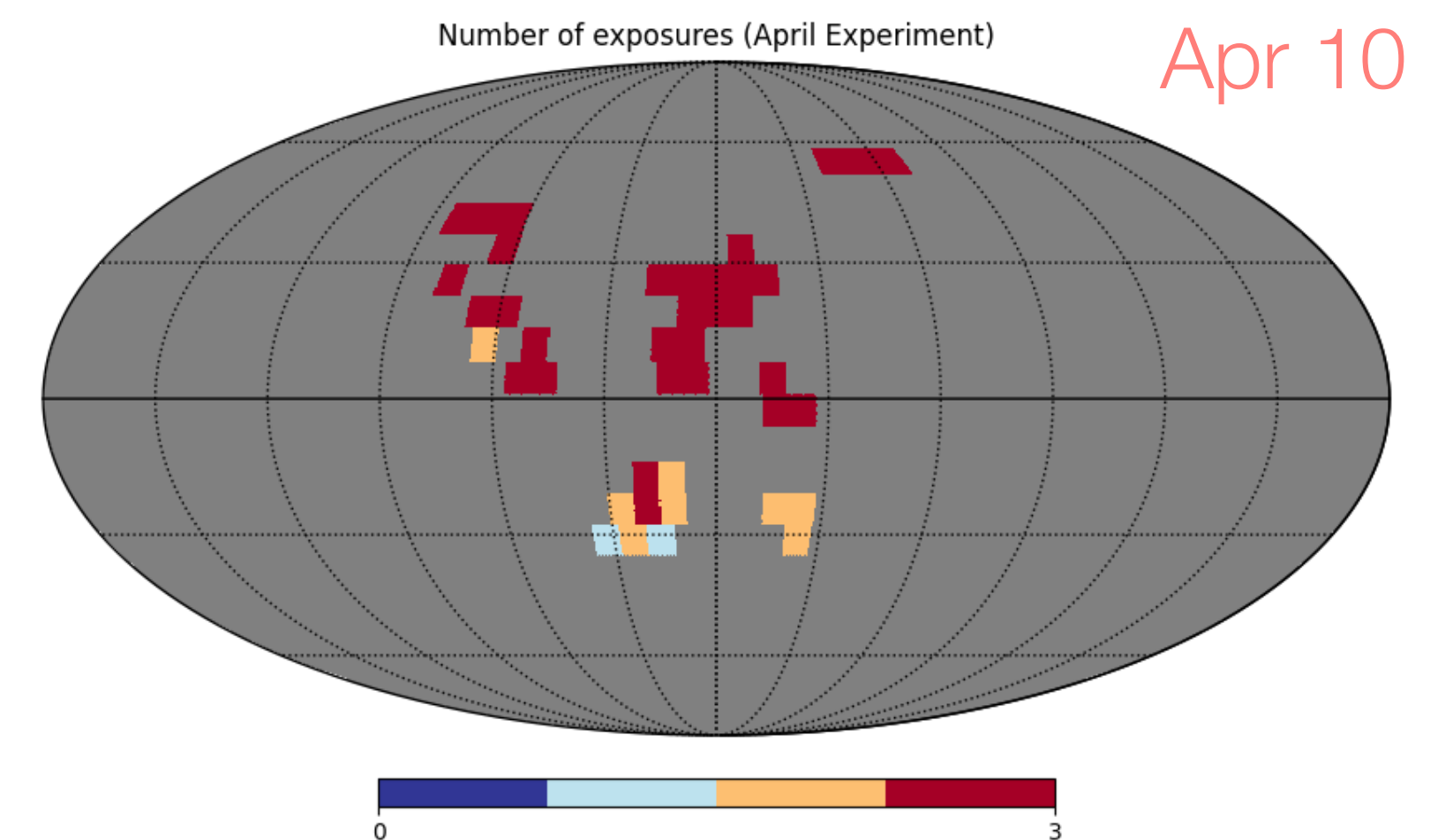
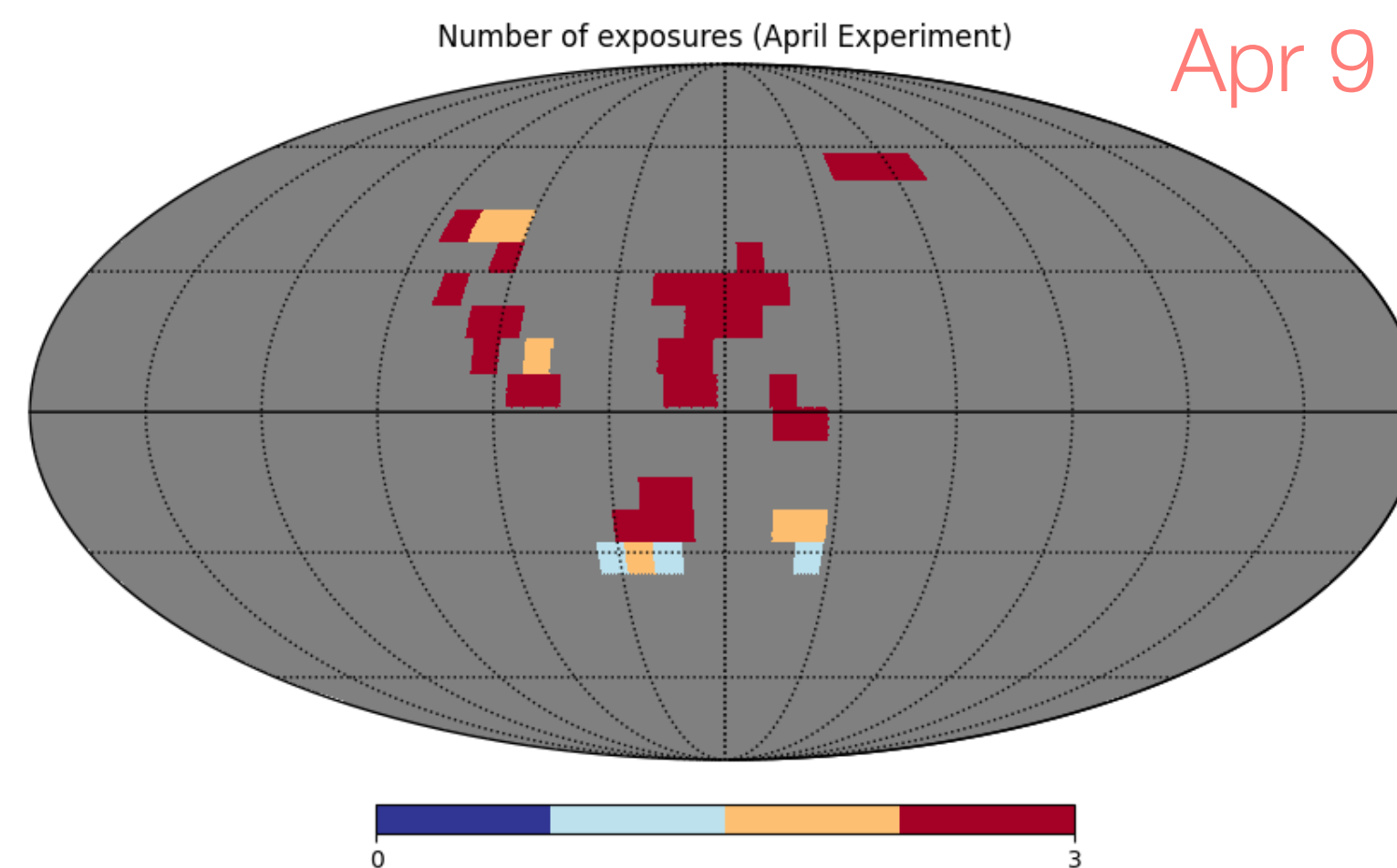
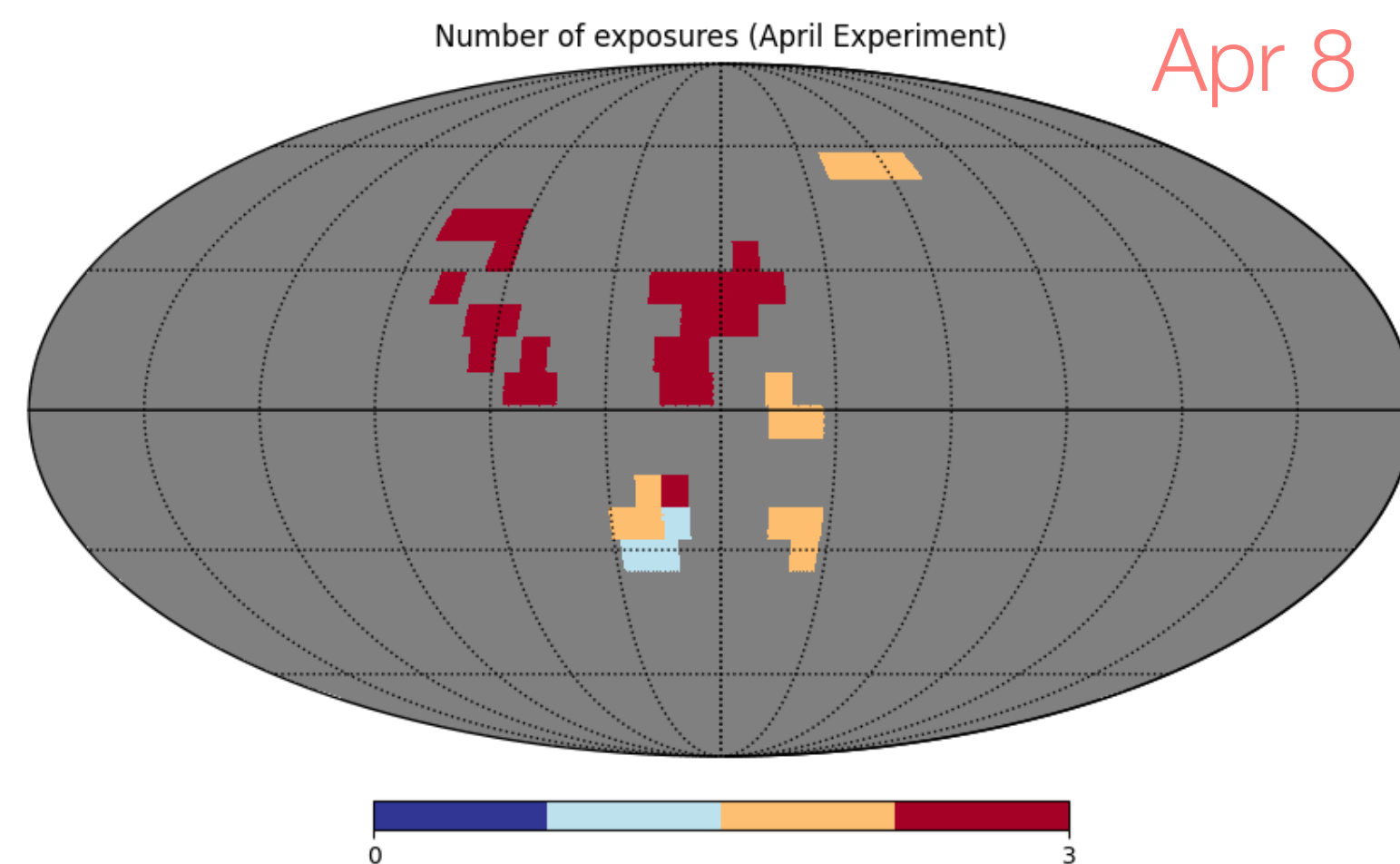
- The experiment is a snapshot-style (three-day) census of optical transients in nearby galaxy clusters.
 - Galaxy clustering — **fewer fields** required to cover local galaxies — **longer exposures** and deeper images.
- Goals: 1) identify underluminous optical transients, and 2) characterize the transients population in a cluster.



- 41 primary fields.
- 240 sec in **g** and **r** + 300 sec in **i**.
- Expected to reach 21.5 in **g** and **r**.

Experiment

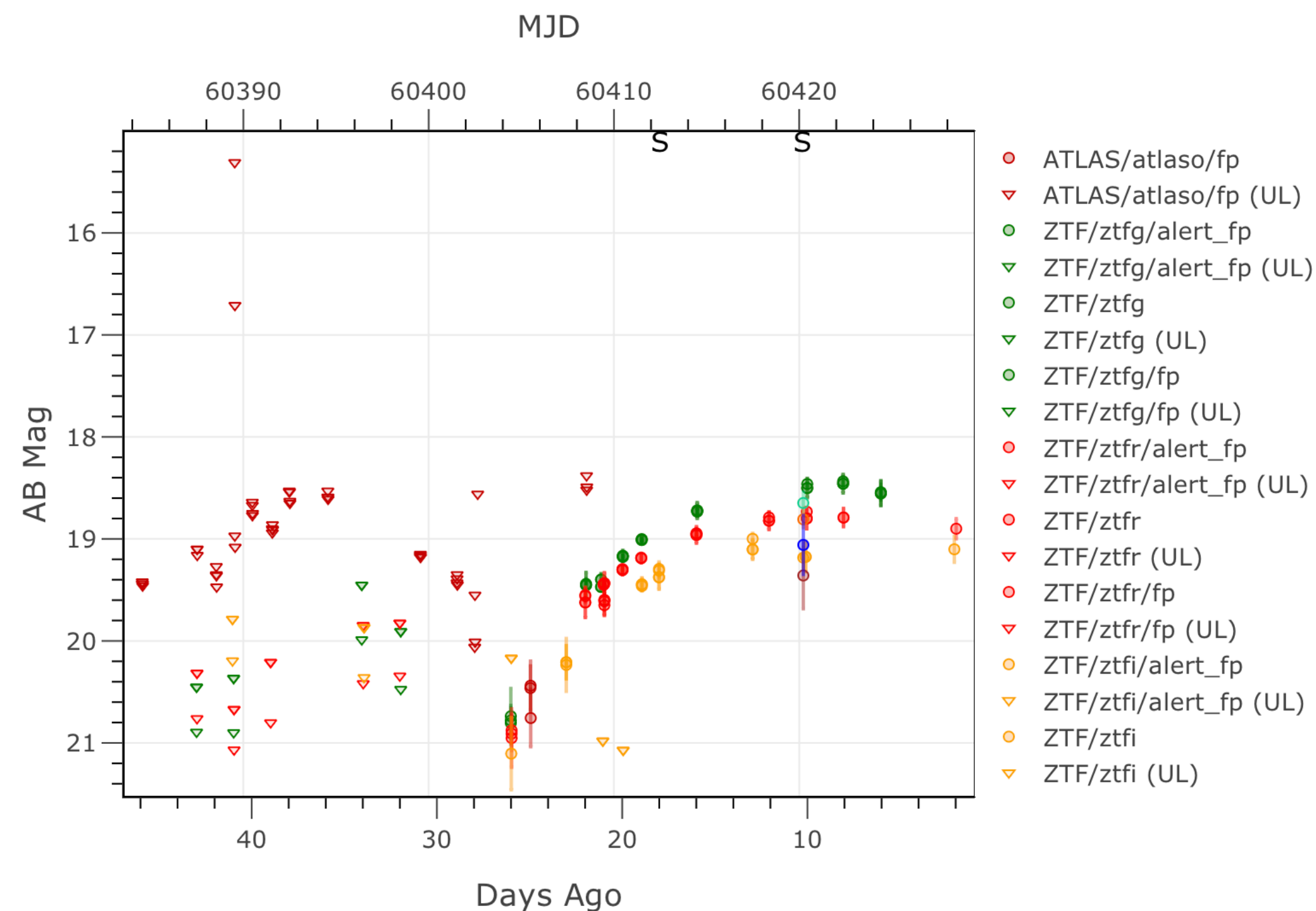
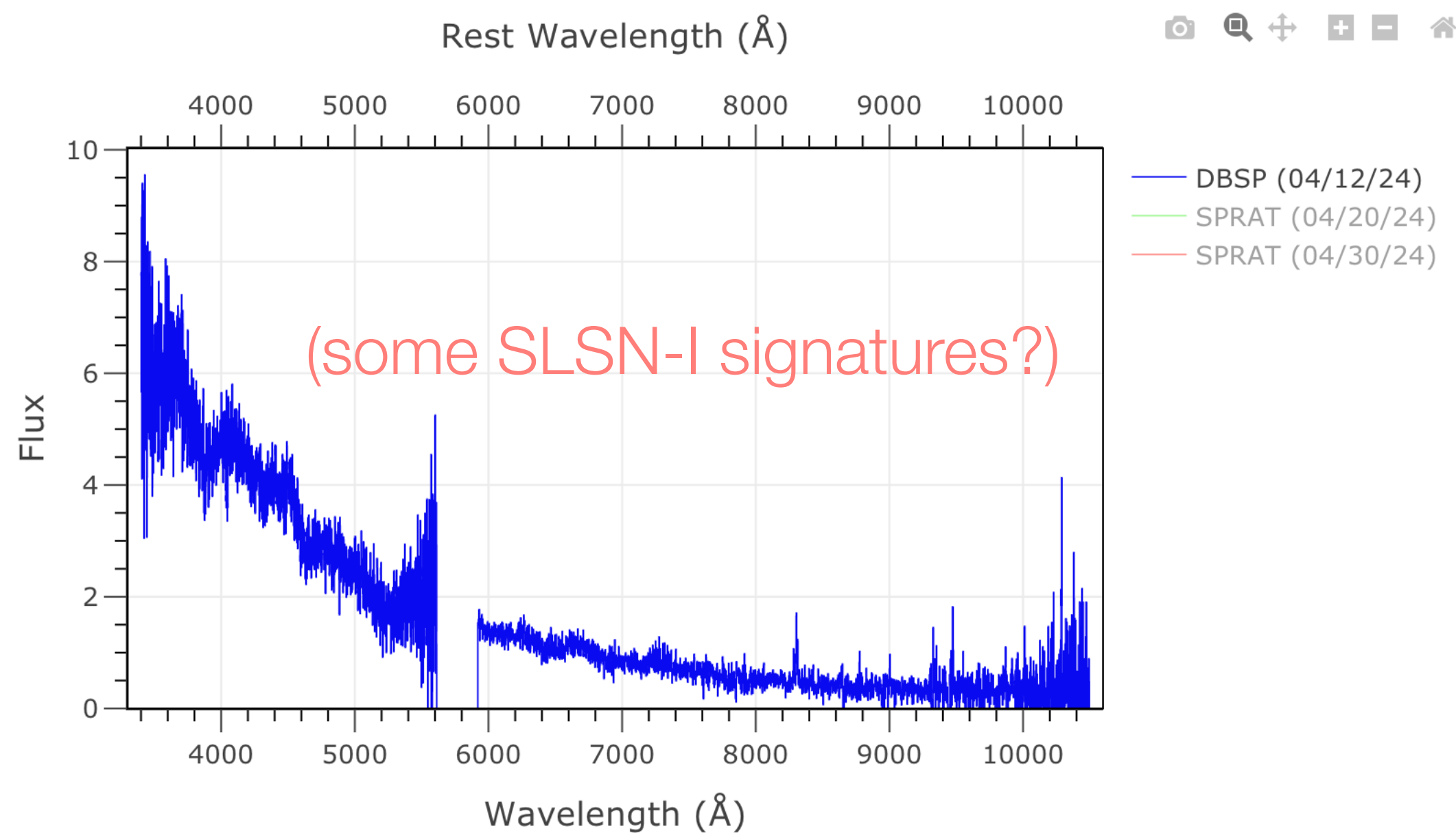
- Good weather condition, but not the best seeing (1.5"+).
- Got most of the requested exposures, but **not** all — missed 11.4% exposures during the three nights.
 - Mainly due to schedulability issues: fields are scattered and exposure time is long (lack of flexibility).
 - Southern fields are incomplete, but they cover the Shapley concentration — a very interesting region!



Number of exposures

Candidates

- We set up a new filter based on the existing RCF/BTS filter for real-time scanning.
- Extending the magnitude limit from 19.0 to 21.5 leads to ***a lot*** of candidates (1000+ per night).
 - Most candidates are variable stars or AGN activities, but there are 100+ reliable transients.
- We selected a few candidates for spectroscopic classification during our 04/11 DBSP run.
- Example: a hostless transient, potentially SLSN



Analysis plan

- Classify transients using existing **photometric** classification code. (There are too many faint transients.)
- Associate transients with host galaxies, use host redshift to estimate luminosity.
- Calculate rising and fading timescales based on their light curves.
- Estimate volume rates using timescales and the number of detections.

Lessons learned

- Simulations required for field selection if completeness and cadence pattern really matter.
- Need to coordinate with the pipeline team:
 - Southern fields cannot be processed due to the lack of Pan-STARRS coverage.
 - I-band images are not immediately processed during the first night.
 - Images are not flagged for immediate release during the first two nights.
- The three-day baseline is too short to distinguish some transients.
- Doing transient science near the detection limit is challenging.