



# DM Considerations for Deep Drilling

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# DM Plans for Deep Drilling

- Deep drilling is part of “10% time for special programs”
- No special-programs-specific processing has yet been defined
- General statement is:
  - Processing for special programs will make use of the same software stack and computing capabilities as the processing for universal cadence. The programs are expected to use no more than ~10% of the computational and storage capacity of the LSST data processing cluster.
- Exotic processing can be done as a Level 3 effort

# Why we're at this session

- The sooner we start organizing a set of options / requests for how to process the DD data, the better we can plan for it, and the more the chance that the DM stack will supply the necessary algorithmic support
- No decisions needed today – we want you to start thinking about this (and reasoning about it together with us)

# Level I (nightly) considerations

## Alert processing options

- If temporal cadence similar to main survey (one visit / 34s, no slews), standard 60-second alert production will “just work”
- Some questions about how to handle alert generation
  - Is treating every “visit” within a deep drilling sequence independently useful to downstream consumers?
    - E.g., if in 10 consecutive visits an object looks the same in each, but different from the (~annually updated) template, should this generate 10 alerts?
    - Would it be useful to update templates more often for DD fields?
  - Should the Level I outputs from this mode be kept together with those from the main survey? E.g., should they contribute to main-survey DIAObjects?

# Level I (nightly) considerations (cont.)

- Alternatives with additional costs:
  - Different cadences?
    - Shorter cadences would exceed planned throughput capacity for alert production, and therefore increase latency (a lot!)
  - Different processing?
    - Coadd a series of visits to do “faint transient detection”? Requires corresponding deep-drilling templates to do this well. Release nightly coadds?
    - All doable with the LSST stack code, configured appropriately, but may require additional processing (hardware) or operations (human) resources
    - For different cadences or processing strategies, default would be to *exclude* the results from the main Level I database

## Level 2 (annual data release) considerations

- Baseline plan is to process deep drilling data independently and keep the results separate
  - DD processing would presumably include the main-survey coverage of those fields
  - Most likely all DD observations would be identified as such “at birth”, by the scheduler, even if they are just additional standard visits

# Deep drilling Level 2 processing options

- Simplest solution would be to replicate the structure of standard data release processing:
  - Key steps: coadd all data; detect on coadds; measure on image stacks; perform forced photometry on individual epochs
  - Issues:
    - Linkage of outputs to main-survey Level 2 databases (e.g.: different Object IDs)
    - Onset of crowding, “percolation” (need for wide-area deblending)
    - Limits of algorithms developed for main-survey depth
    - Scaling of computing (more Objects, more blends, scaling and convergence of Multifit)

# Forced photometry in DD fields

- Perform forced photometry on all DD (and main survey) fields for all DD objects?
- Would it be useful to also do forced photometry on all DD fields for all main-survey objects?
- Perform “faint forced photometry” on nightly coadds?
- Is it adequate to do this at catalog level, adding up lots of non-detections with uncertainties?



# User interface

- Do the Deep Drilling programs or processing suggest any requirements for additional features or behavior in the Science User Interface & Tools?

# Next steps

- Think about all the different DD scenarios and cadences
  - What processing is appropriate to the desired science return?
- Continue conversation on [community.lsst.org](http://community.lsst.org)