Dust in our galaxy causes extinction

Avoid dense star regions close to the plane (for main survey: might have MW additional); need some for VIS calibs

Extinction maps (Schlegel et al) + Gaia model 10 (DPAC, Luri et al number density isocontours G<20)
Galaxy density for WL: want the overall average $> 30$ /sq arc min

extinction & stars

max zodiacal backgr

ex: window f. multipoles

Figure 6: Celestial sphere in Mercator projection cut at $|b|<30$ and with different colors for the different 5 years of observations (red, green, blue, cyan, magenta), now contiguous. The results with the last conditions to avoid the flip flop on the galactic plane are shown in Figure 6 (the numbers of covered pixels by year are the same). If needed, it can be easy to implement things in the fifth year such as to have a regular final boundary.

3. Results for the reference survey

Figure 7: Histogram of latitude values for the different 5 years of observations (red, green, blue, cyan, magenta) shown in Fig. 6

best areas first
Euclid Survey Areas, (~2012)

$N \sim 1.5-2 \times 10^9$ Weak Lensing sampling

$N \sim 5-6 \times 10^7$ ditto for Clustering

R.S & J. Amiaux (ESAC tool)
For calibrations use specific targets or the Deep Fields

NISP calibrators above, for WL need dense star regions (in the galaxy plane)
Table 4.4.61: Calibration + Deep expected durations (% of the total survey duration)

- P-R-NP-CAL-F-002: NISP-P Survey Self-Calibration 39 days 1.8%
- P-R-NP-CAL-F-005: NISP-P Absolute Standards Observations 4.7 days 0.3%
- P-R-NP-CAL-F-010: NISP-P Photo-z Training Sample 29.95 days 1.4%
- P-R-NS-CAL-F-001: NISP-S Absolute Standards Observations 22.6 days 1.1%
- P-R-NS-CAL-F-003: NISP-S Planetary Nebula Observations 3.25 days 0.2%
- P-R-NS-CAL-F-004: NISP-S Purity Sample 50 days 2.3%
- P-R-VS-CAL-F-004: VIS PSF Model 1 50 days 2.3%
- P-R-VS-CAL-F-005: VIS Noise Bias Calibration Sample 9.8 days 0.5%
- P-R-VS-CAL-F-006: VIS Color Gradient Observations 8.15 days 0.4%
- P-R-VS-CAL-F-009: VIS Absolute Standards Observations 2 days 0.1%

Deep Field (additional to calibration) 117 days 5.4% 
Total NISP P 73.65 days 3.4% 
Total NISP S 75.85 days 3.5% 
Total VIS 69.95 days 3.2% 
Additional Deep 117 days 5.4% 
Total 336.45 days 15.5%
Deep Field(s): calibration reqs (being updated) + science

Need high ecliptic latitude for observability (want low extinction too)

main requirements:
2x20 sq deg
2 mags deeper than wide

Part of the SEP is covered by the Large Magellanic cloud ... not good for deep xgal field so need to move sideways (shorter visibility)

Fig 5.6: Left panel: Northern Deep Field projected on a sky extinction map. Right panel: Southern Deep Field

Possible location for the southern deep field

solutions will change after optimization

Figure 5.6: Left panel: Northern Deep Field projected on a sky extinction map. Right panel: Southern Deep Field

Part of the SEP is covered by the Large Magellanic cloud ... not good for deep xgal field so need to move sideways (shorter visibility)
To tile or not to tile......

Pantheon

Tiles!!

introducing ECTile !! ©

Healpix, (Gorski et
The visual/manual approach must be superseded by optimization algorithms which take into account various quantities and boundaries.

S. Carvalho (predefined tiling: minimise overlaps but needs some range in alpha)

Try to fill regions left empty because of observing calibrations (large slews....)

J. Dinis (adaptive tiling: keep same alpha within local rectangle but waste some overlaps at boundaries)
at a given time can observe towards leading or trailing direction, i.e. two "strips" (limited pitch angle) separated in by 180 deg in ecliptic longitude

**Straight-stripes: select fields in-sync with orbit.**

**Rationale:** make transitions from patch to patch in-sync with orbit keeps observations near zero alpha.

**Disadvantage:** patches are not as wide as it can be does not promote easy side-by-side match (and compensate cal-windows)

---

J. Dinis

João Dinis– ESSWG – teleconf on 2015-04-21
Local tesselations, ~1.6% overlaps
tilts -7<--> 5 degs

Different rows refer to yearly visibility
Color codes to surveyed areas
Light and dark colors are trailing and leading

next: some fine tuning & $W(c)$

J. Dinis

6 years of observations unfolded

Reserved for calibrations

Fulfill > 15,000 sq degs (+ calibs + deep fields + manouvers) in 5.5 years [$t_{exp}=4400s$]
The Euclid Reference Survey (SPV, 2017, green overlay) versus the Red Book limits (ground surveys)

- Ecliptic plane [zodiacal light background]: +/- 15 deg. ecliptic latitude exclusion zone
- Galactic plane [stellar contamination]: +/- 25 deg. galactic latitude exclusion zone
- Absorption [dust]: E(B-V)<0.08 + holes&islands avoided by pushing locally up to 0.15

Survey SPV (weight only for spectra)
Euclid & LSST synergy: 2/3 of Euclid Wide + 1 Deep Field

- Advanced discussions between the Euclid Consortium and LSST have started
- The "LSST and Euclid Synergy" White Paper out fall 2017 (Rhodes et al.)
- **Unique legacy survey**: 2 billion galaxies imaged in optical/NIR to mag >24
  Million NIR galaxy spectra, full extragalactic sky coverage, Galactic sources
- Unique database for **various fields in astronomy**: galaxy evolution, search for high-z objects, clusters, strong lensing, brown dwarfs, exo-planets, etc
- **Synergies with other facilities**: JWST, Planck, Erosita, GAIA, DES, Pan-STARSS, LSST, E-ELT etc (e.g. to do NIR from the ground would take several x 10³ yr)
- **All data publicly available** through a legacy archive

*Euclid in context*

<table>
<thead>
<tr>
<th></th>
<th>VISTA</th>
<th>SASIR</th>
<th>Euclid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wide survey</td>
<td>680 yr</td>
<td>66 years</td>
<td>5 years</td>
</tr>
<tr>
<td>Deep survey</td>
<td>72 years</td>
<td>7 years</td>
<td>“5 years”</td>
</tr>
</tbody>
</table>

**Enormous database to harvest**
Possible outcomes.....

Quite useful but a bit dull....

Quite interesting!

Much more interesting!!

A new paradigm would be needed?

$\Omega$

$\Lambda = \text{const}$

$w \neq -1$

Different probes & experiments
Summary:

★ *Best* science (cf Decadal)

★ Enormous Legacy

★ Tough but feasible

Stay tuned!