

Using LiDAR in Spain

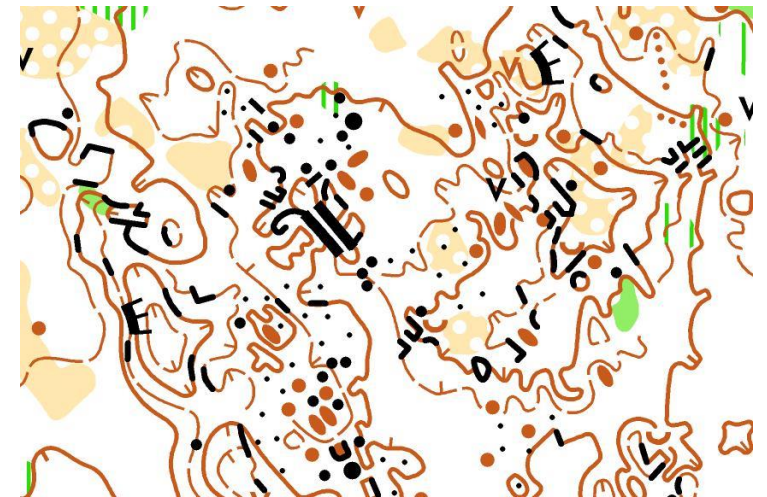
LiDAR Workshop – Orienteering Australia

Manuel Jurado

Bathurst, Friday 29 September 2017

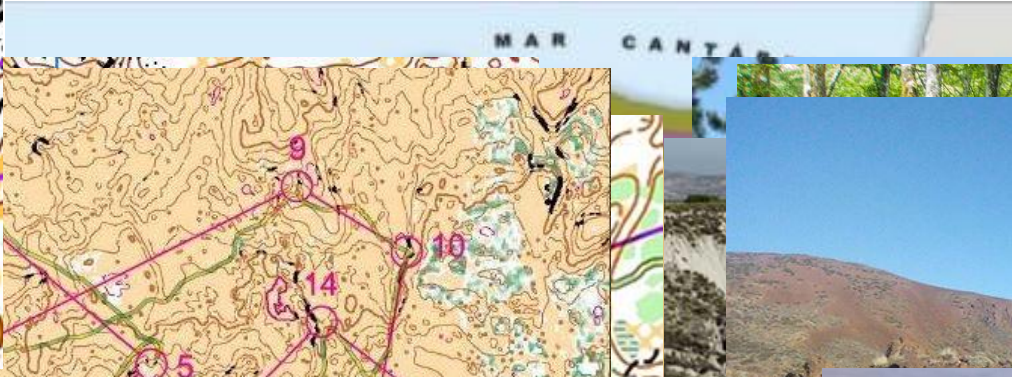
1. PRESENTATION
2. BACKGROUND
3. WORKFLOW
4. EXAMPLES
5. CONCLUSIONS
6. REFERENCES

- Manuel Jurado (Alicante, 1992)
- Spanish Squad (EYOC, JWOC, WUOC)
- Bachelor in Geomatic Engineering (UPV)
- IGN (Photogrammetry) / TracTrac
- Mapped in AUS (NT), ESP, SLO
- Researching about LiDAR since 2014
- Favourite terrain: karst, sand dunes

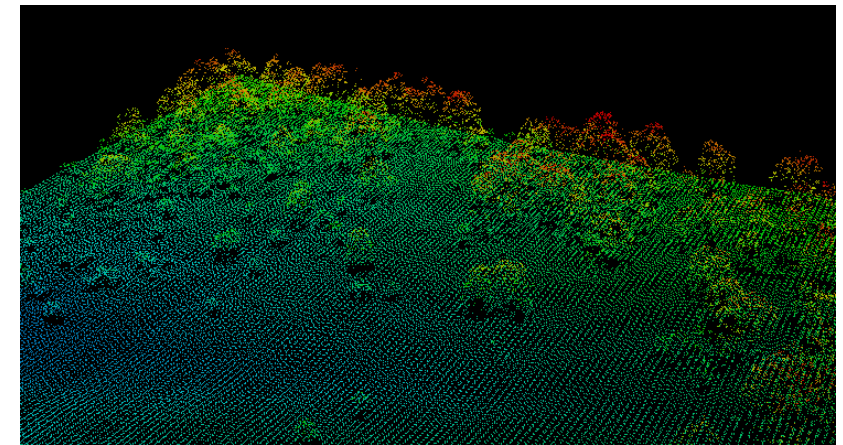
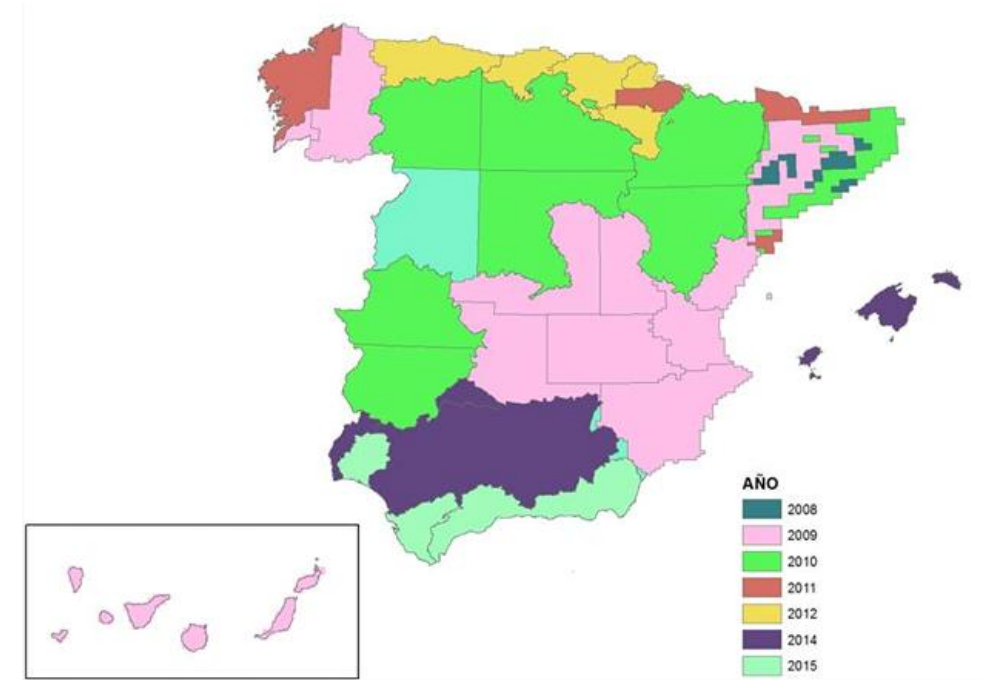


BACKGROUND

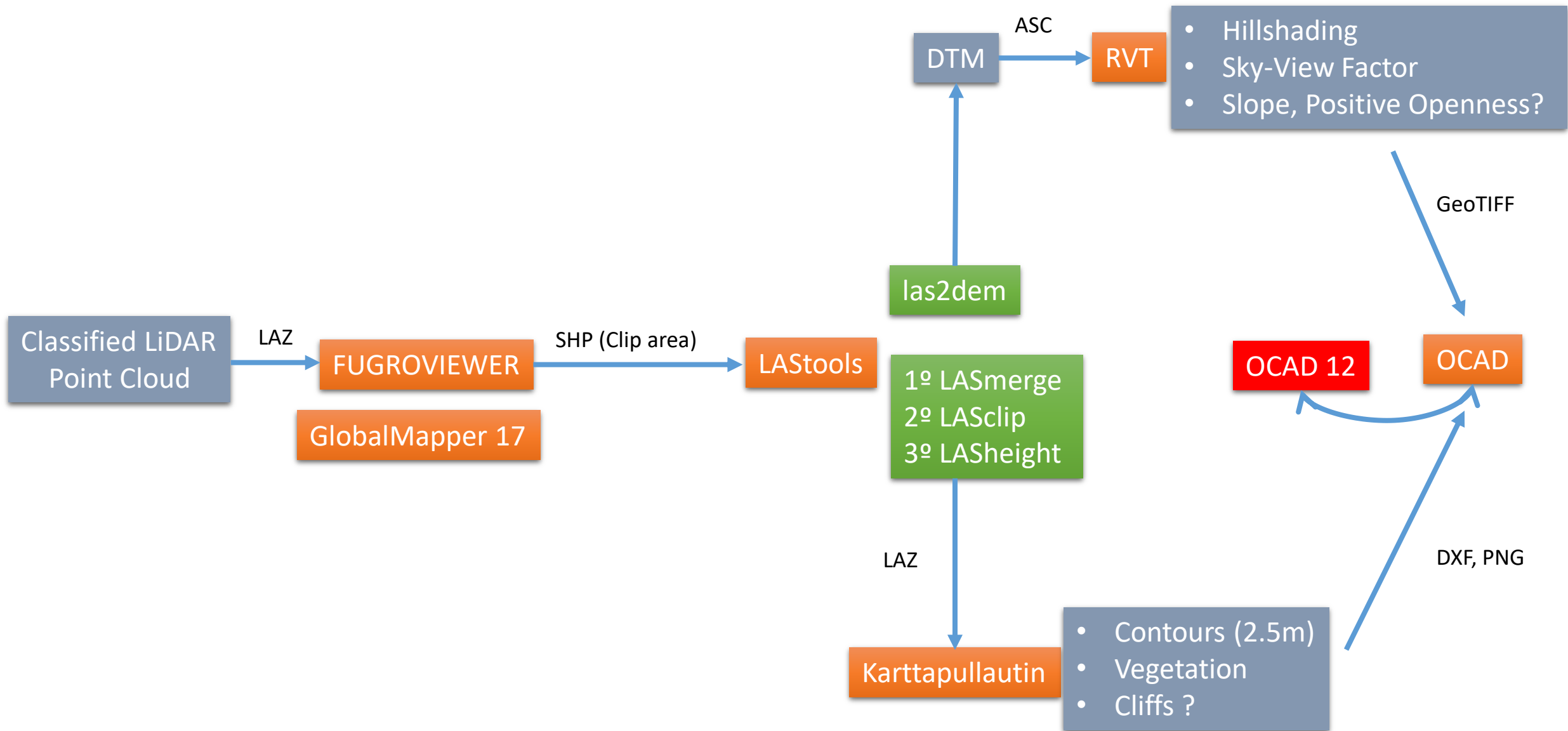
mixture of terrain types



- IGN (*National Geographic Institute of Spain*)
- PNOA (*National Plan of Aerial Ortophotography*)
 - 0.25 m GSD Ortophotos
 - 2x2 m DTM
- 0.5-1 pt/m² LiDAR point density
- Open data ([IGN Download Centre](#))
 - 2x2 km LAZ
 - RSME $z < 0.20\text{m}$
 - RGB-NIR
 - Classes 1-7, 12
 - ETRS89, UTM - Orthometric height

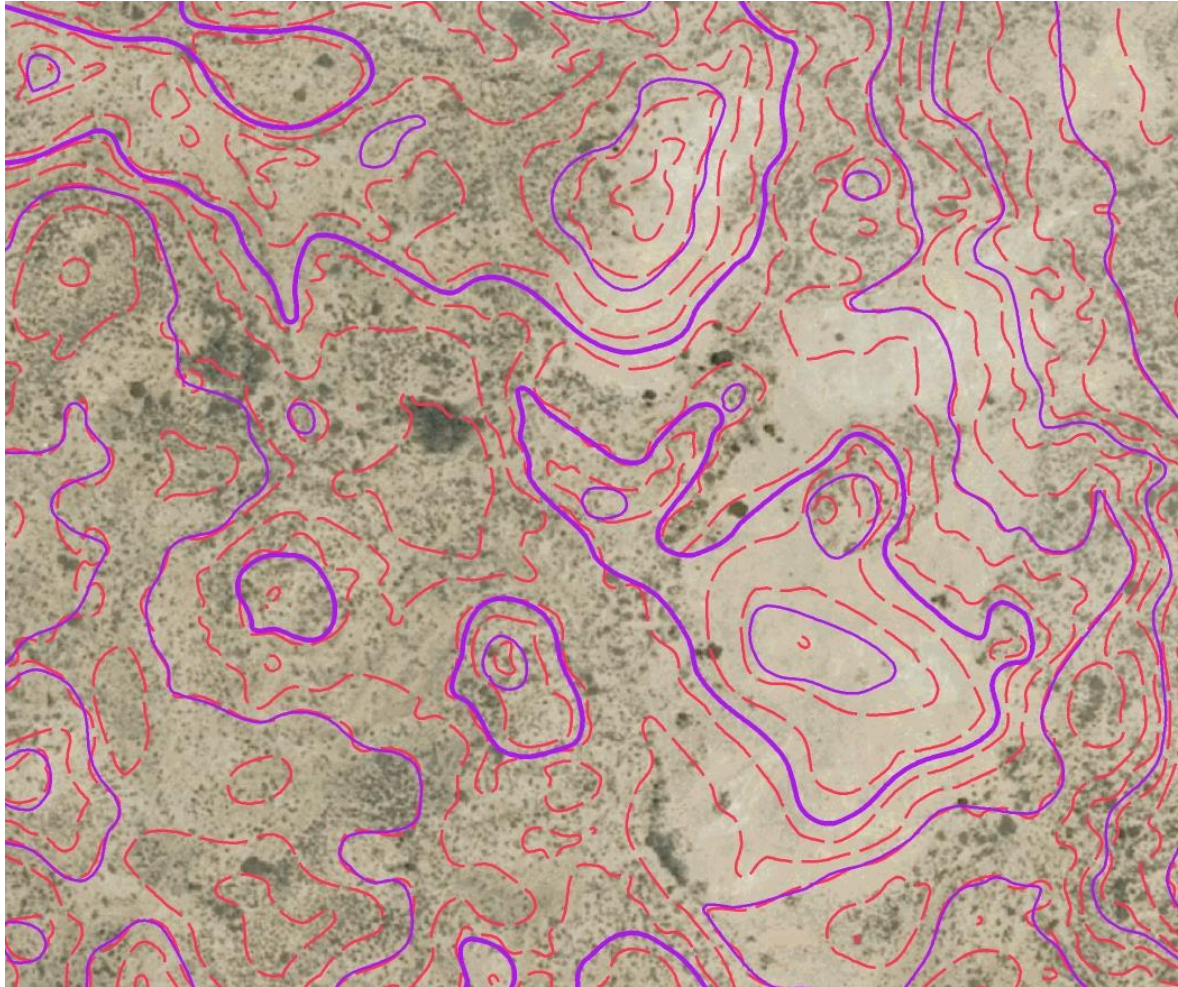


WORKFLOW

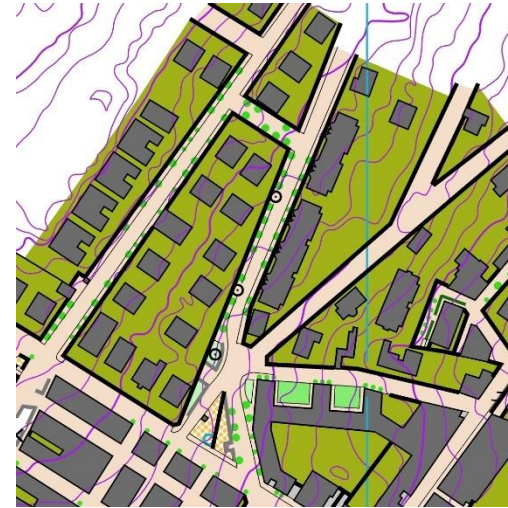


EXAMPLES - Contours

Purple contour: 2.5 m Karttapullautin
Red dashed contours: 1m Global Mapper



Arenales (Alicante)



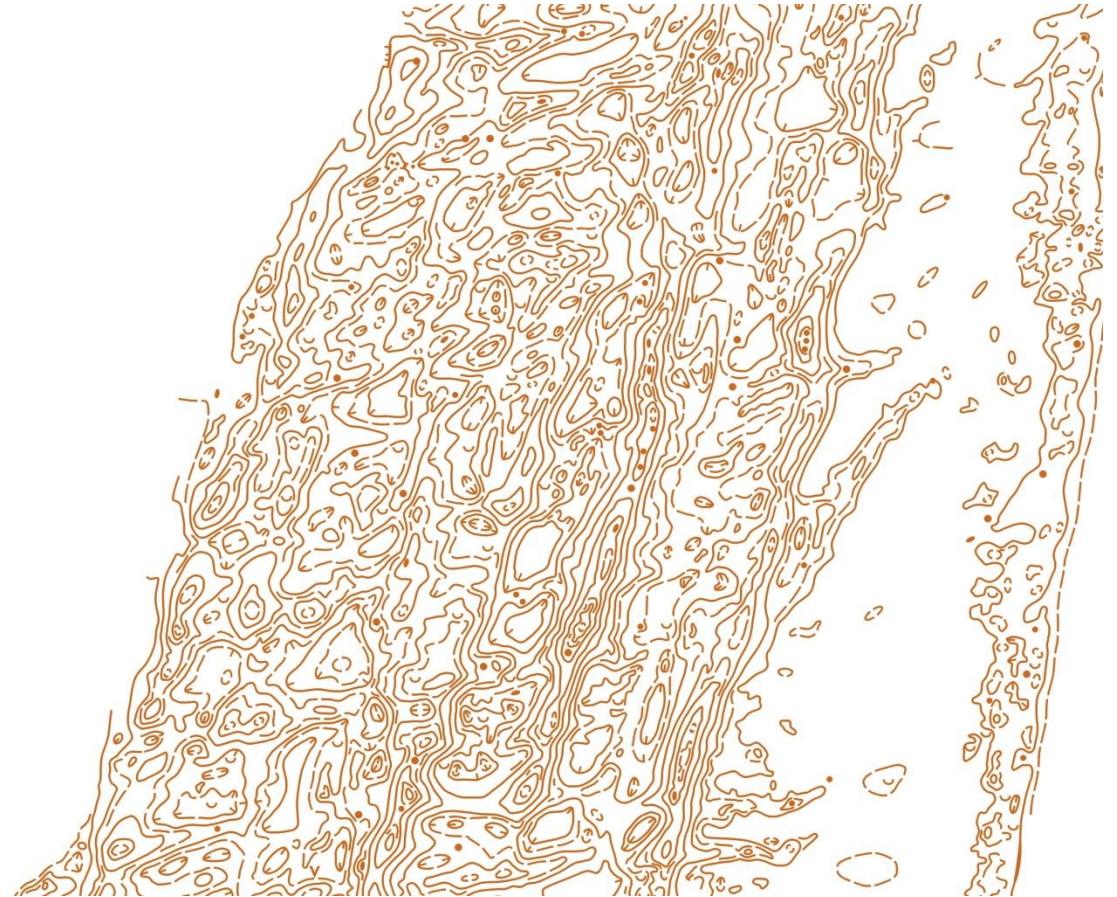
San L. del Escorial (Madrid)

EXAMPLES - Contours

- JWOC 2002 Guardamar (Alicante)



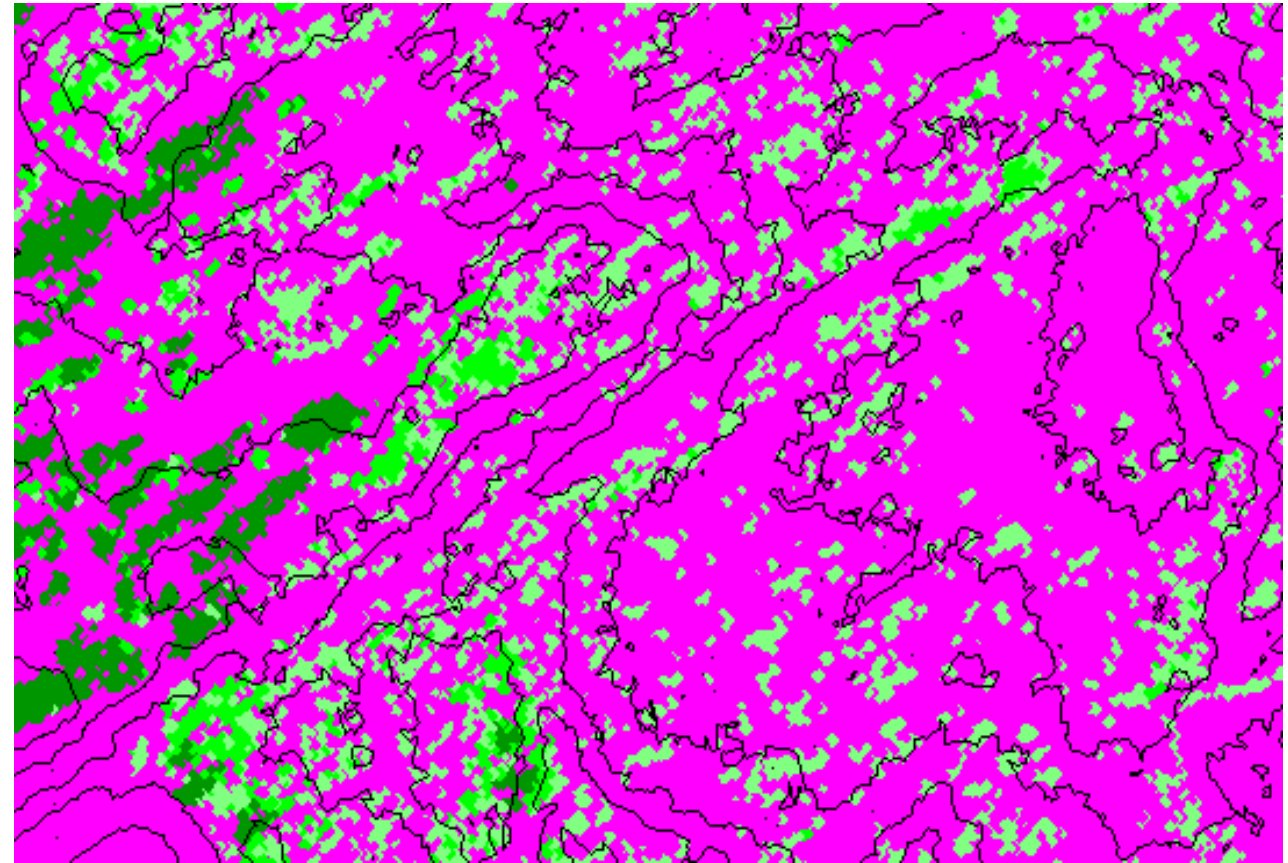
O'Map 2.5m – Base map: Ortophoto (V. Pravilo, 2002)



O'Map 2.5m – Base map: LiDAR + Ortophoto (I.Peilans, 2015)

EXAMPLES - Vegetation

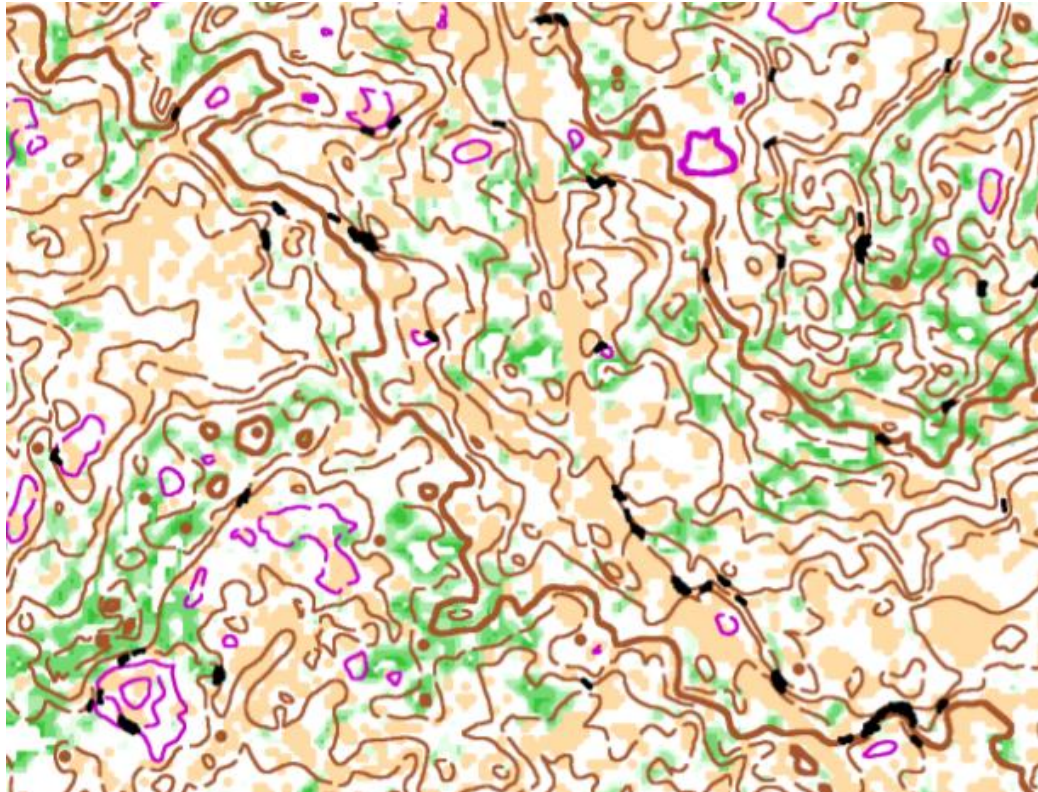
- Low Vegetation classified as Ground



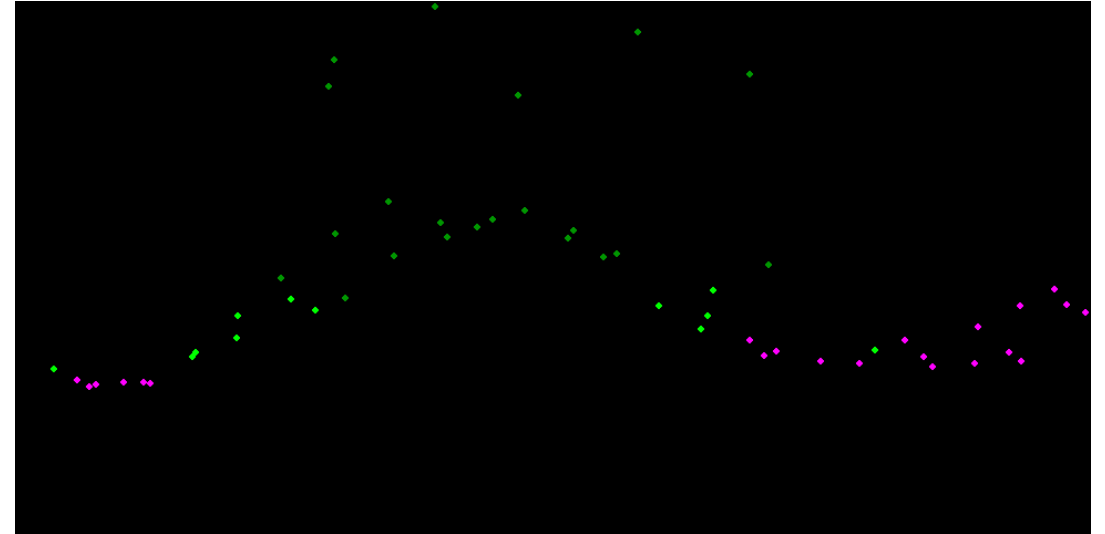
Guardamar (Alicante)

EXAMPLES - Vegetation

- Ground classified as Low Vegetation



Pinar de Chío (Tenerife)



EXAMPLES - Rocks

- Boulders classified as High Vegetation

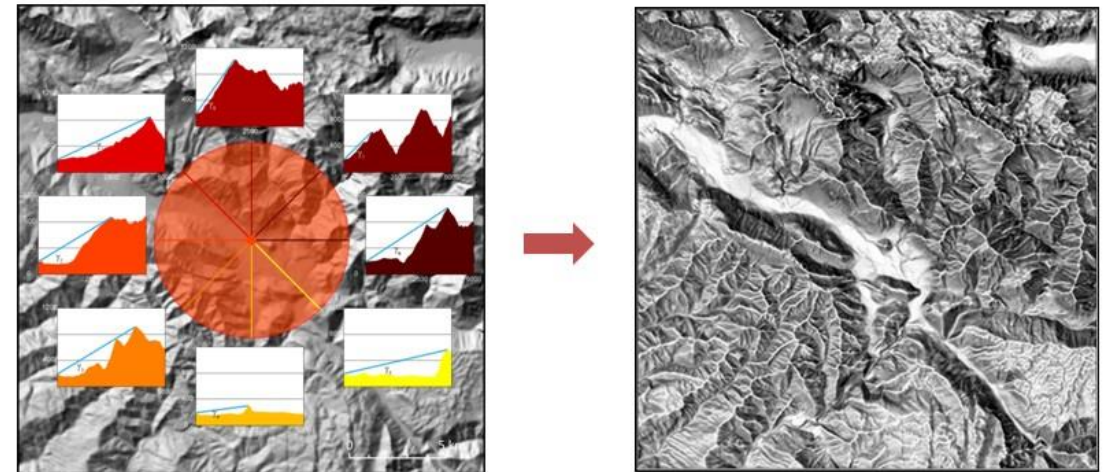
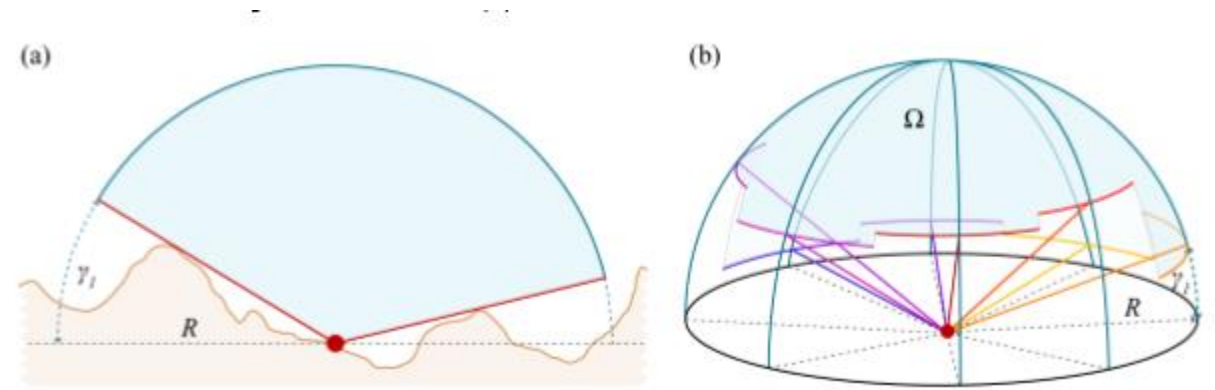


Map maker: Jaime Montero

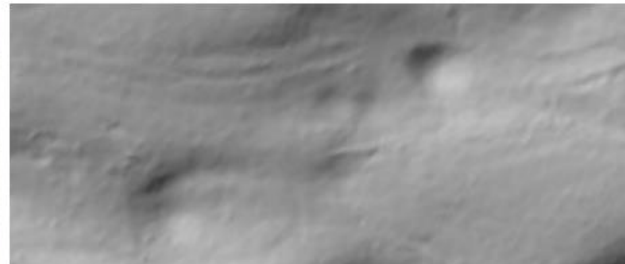
Ciudad Encantada (Cuenca)

EXAMPLES – Sky-View Factor

- [Relief Visualization Tool](#) (Kokalj et al. 2011)
- Determines the size of the visible sky
- Elevation angle is determined into multiple directions and to the given distance
- Considers a hemisphere only
- Values between 0 and 1
- Intuitive
- Distinction between concave and convex features



EXAMPLES – Sky-View Factor



Ortofotografía PNOA - MDT LiDAR 2 m



Orienteering Map

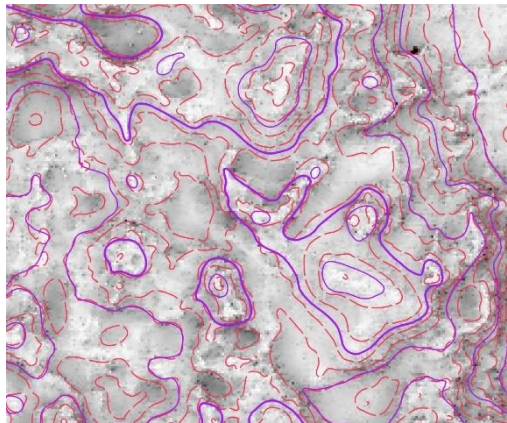
Shaded relief

Sky-View Factor

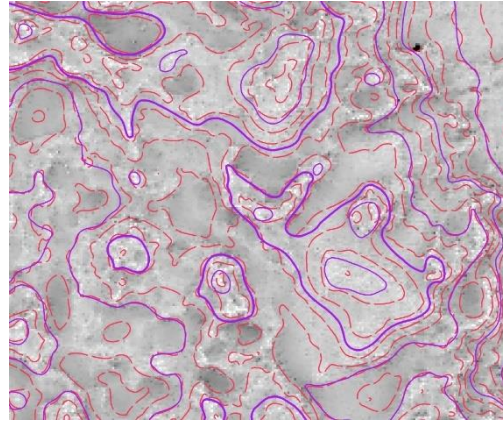
Map maker: R. Pascual Orcajo

Urbasa (Navarra)

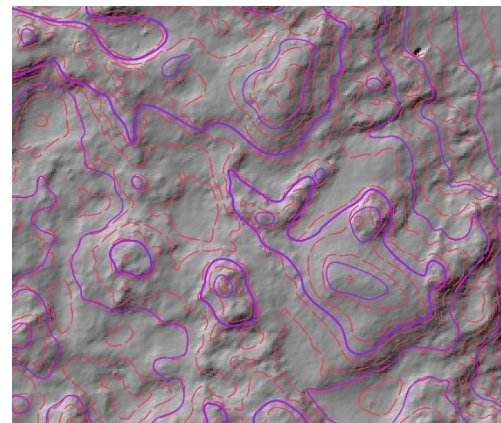
EXAMPLES – SVF & Positive Openness



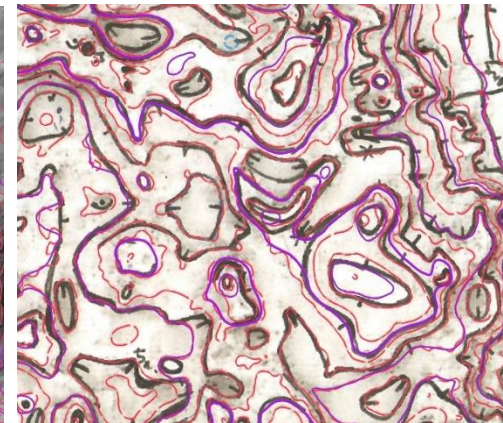
SVF



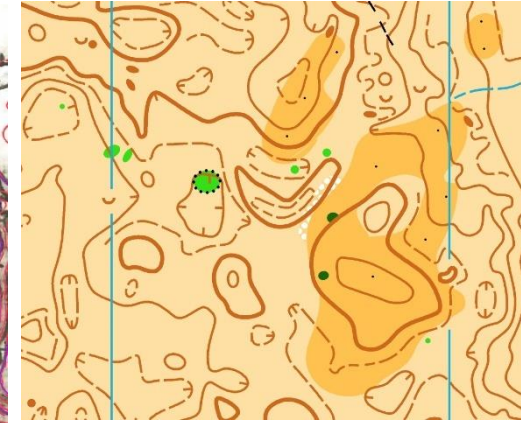
PO



HS



Field work



O'Map

Los Arenales (Alicante)



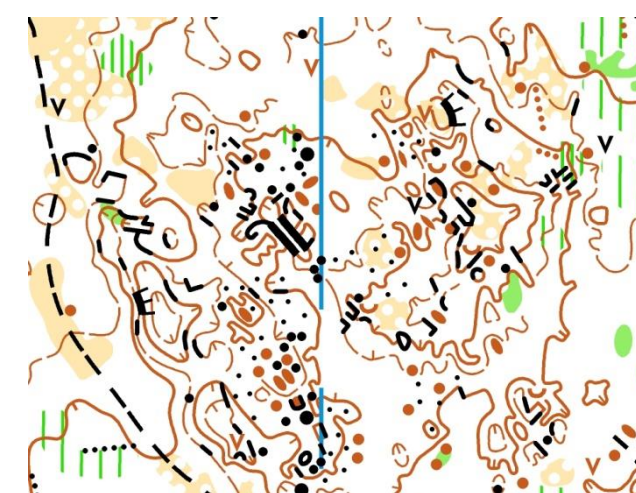
SVF



PO



HS



O'Map

Muela de San Felipe (Cuenca)

- Good point classification = good base map
 - Combination LiDAR-NIR flights
 - + Point density (2-4 pt/m²)
- Sky-View Factor / Positive Openness vs Hillshading
- Different terrain -> different parameters
- “Noisy” vs smoothed contours

- [Open LiDAR Spain](#) (LAStools Google Group)
- [Spanish National Geographic Insitute](#)
- [Sky-View Factor](#) (Zaksek et al., 2010)
- [Red Relief Image](#) (Chiba et al., 2008)
- [Openness as Visualization Technique](#) (Doneus, 2013)
- [Orienteering Spain \(FEDO\) Mapping Committee](#)
- [FugroViewer](#)
- [LAStools](#)

Thank you!

Questions?