



Patching a perfect DEM !?

- It's all about the water

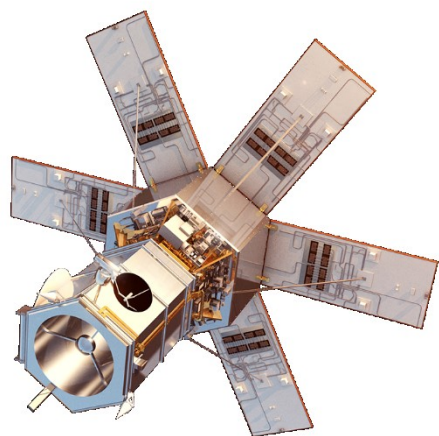


Danish National Mapping Agency - SDfE

Office for Earth Observations

Data acquisition

Satellite



Aircraft

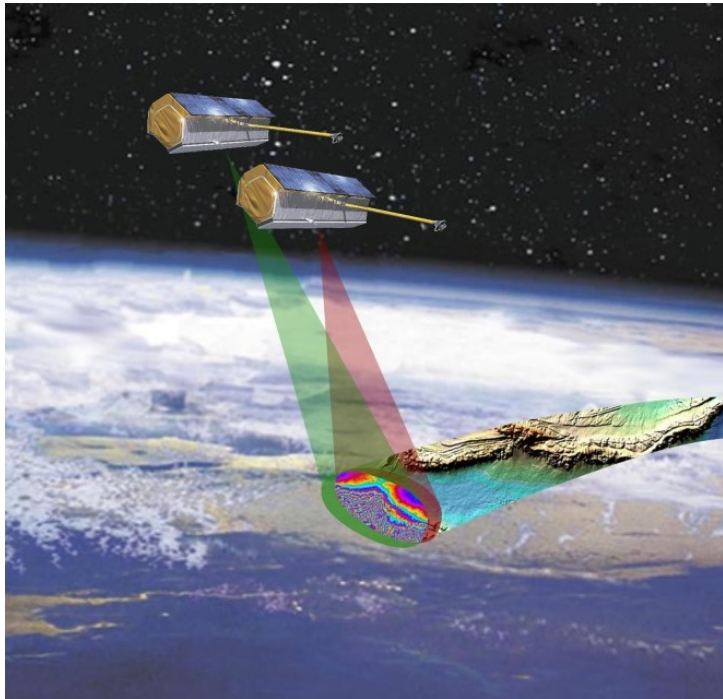


UAS/Drone

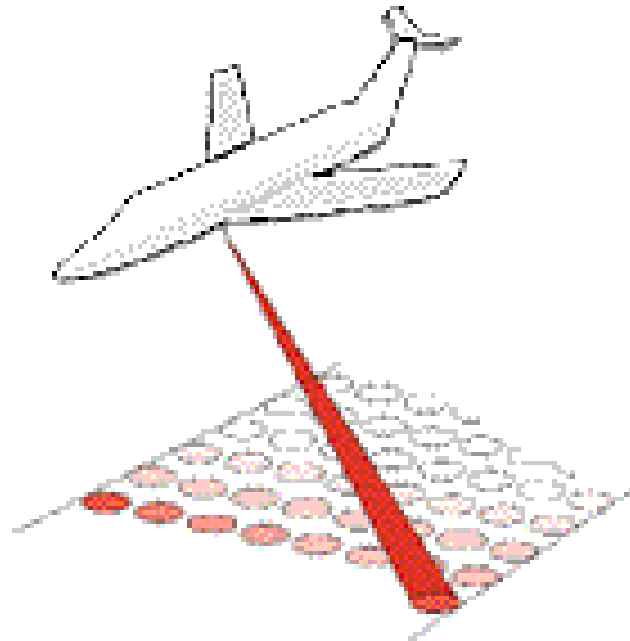


Sensors

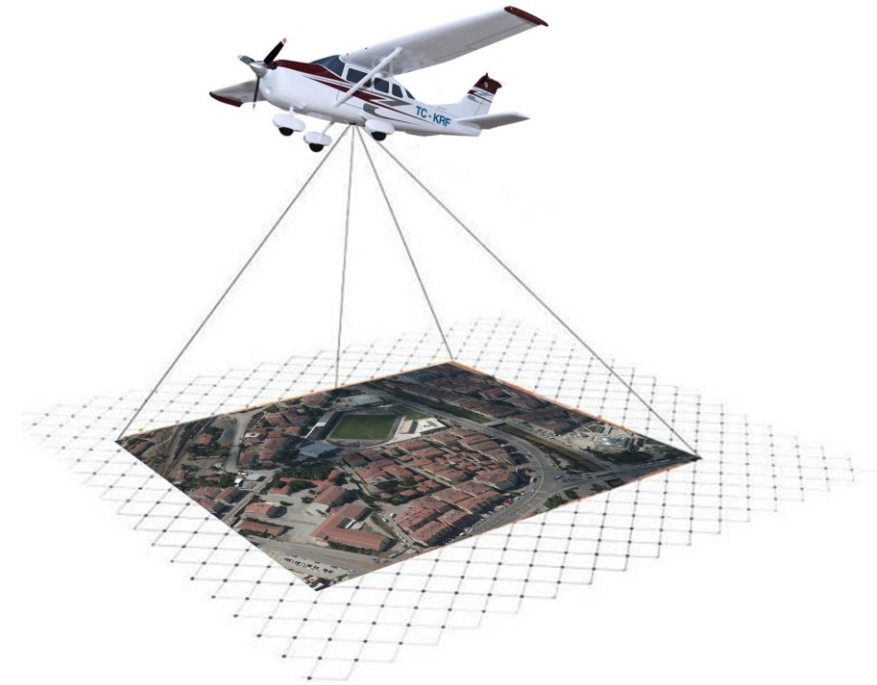
RaDAR



LiDAR



Photo



Products



Ortho photo



Topographic maps



Elevation models



Hydrological maps

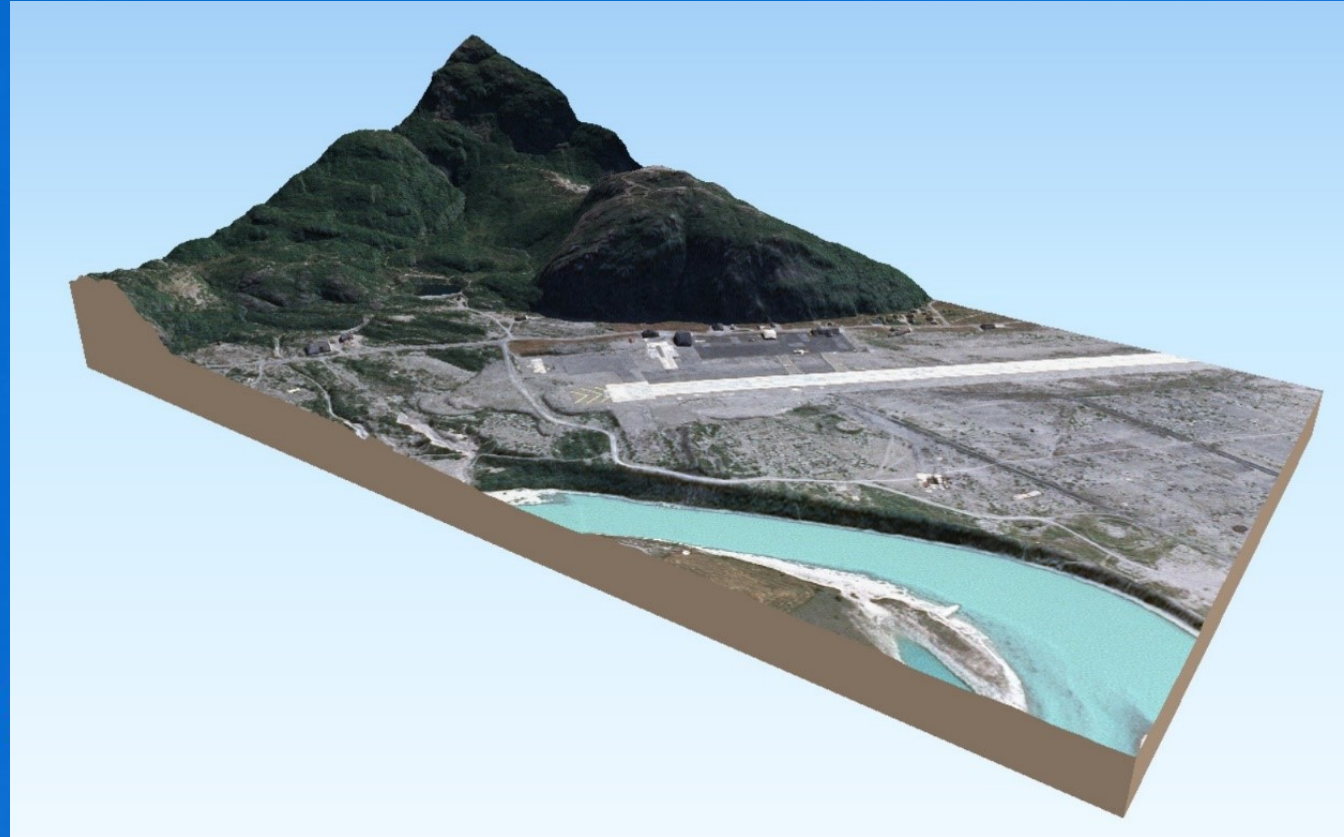
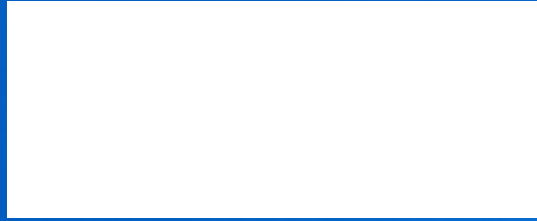


Oblique imagery



Technical maps

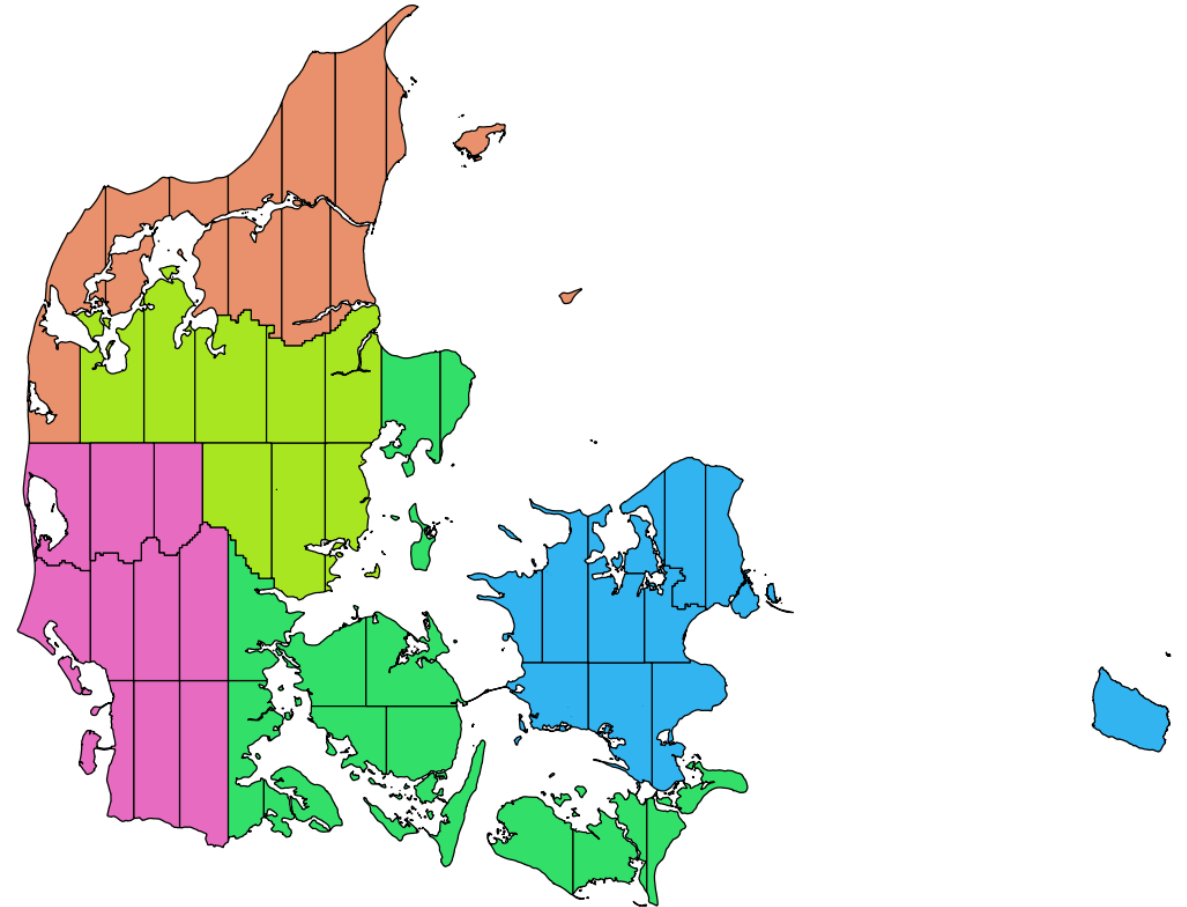


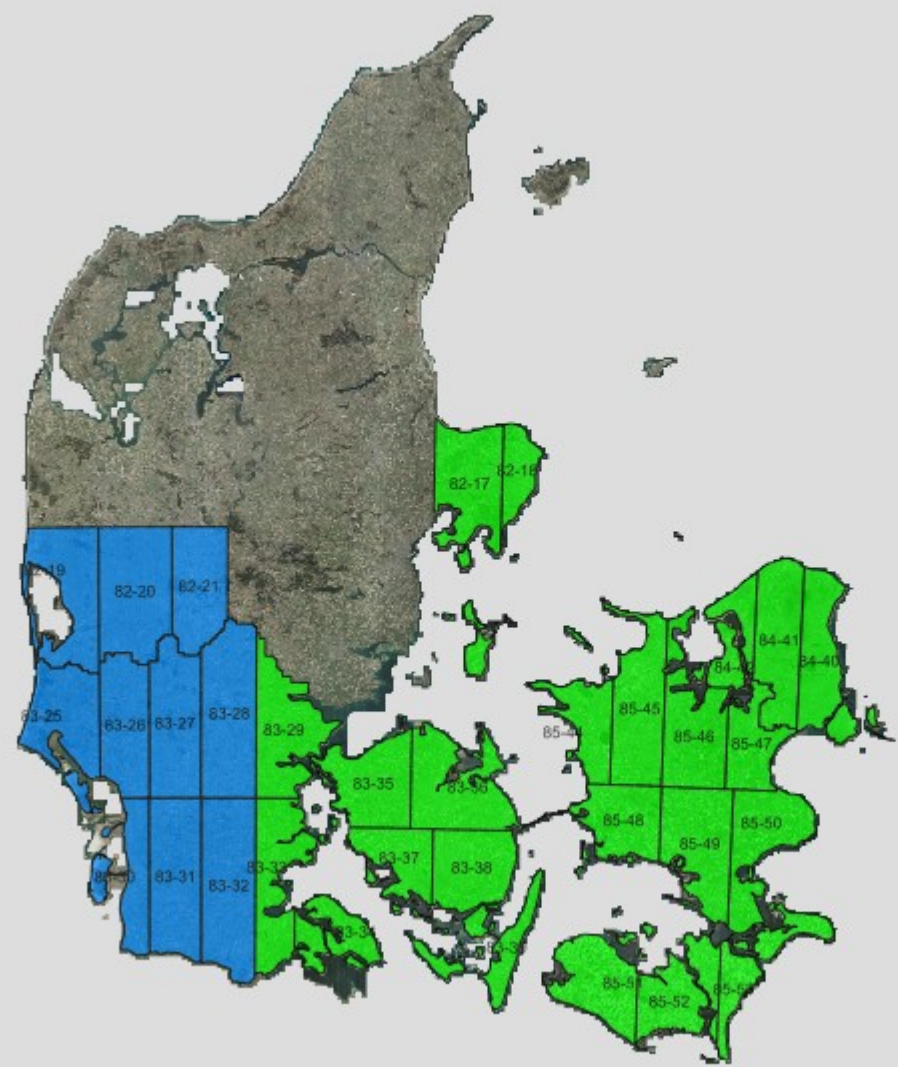


SDFE – Elevation Models

Data acquisition

- 2007 - First DK DEM
 - 0,45 ppm² – raster resolution: 160 cm
 - DTM only
- 2015 – #1 revision
 - 4 ppm² - raster resolution: 40 cm
 - DTM, DSM and Point cloud
- 2018... #2 revision - ongoing
 - 8 ppm² - raster resolution: 40 cm
 - DTM, DSM, PC and Full waveform (as extra bytes)
 - 1/5 of Denmark updated per year

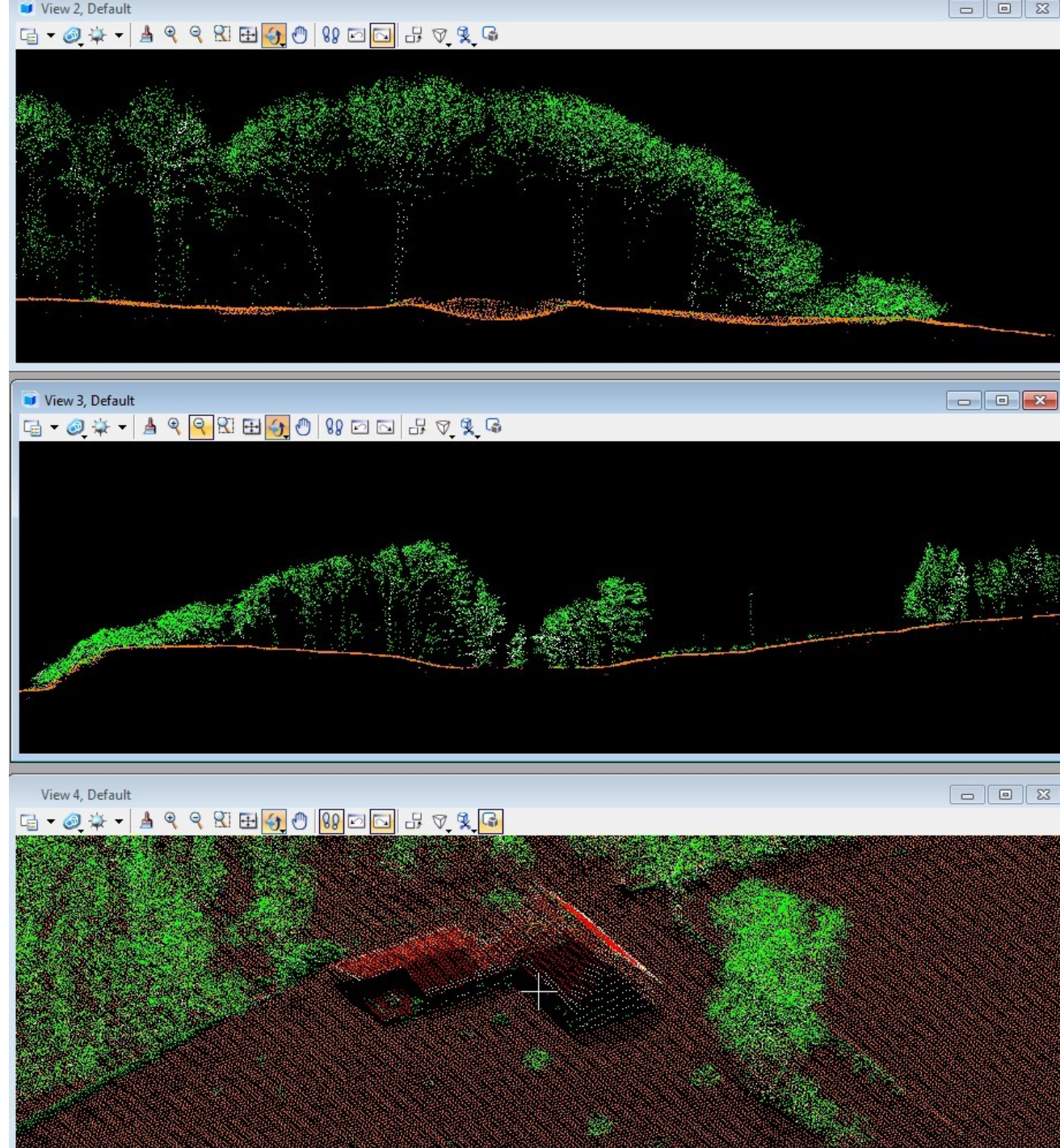




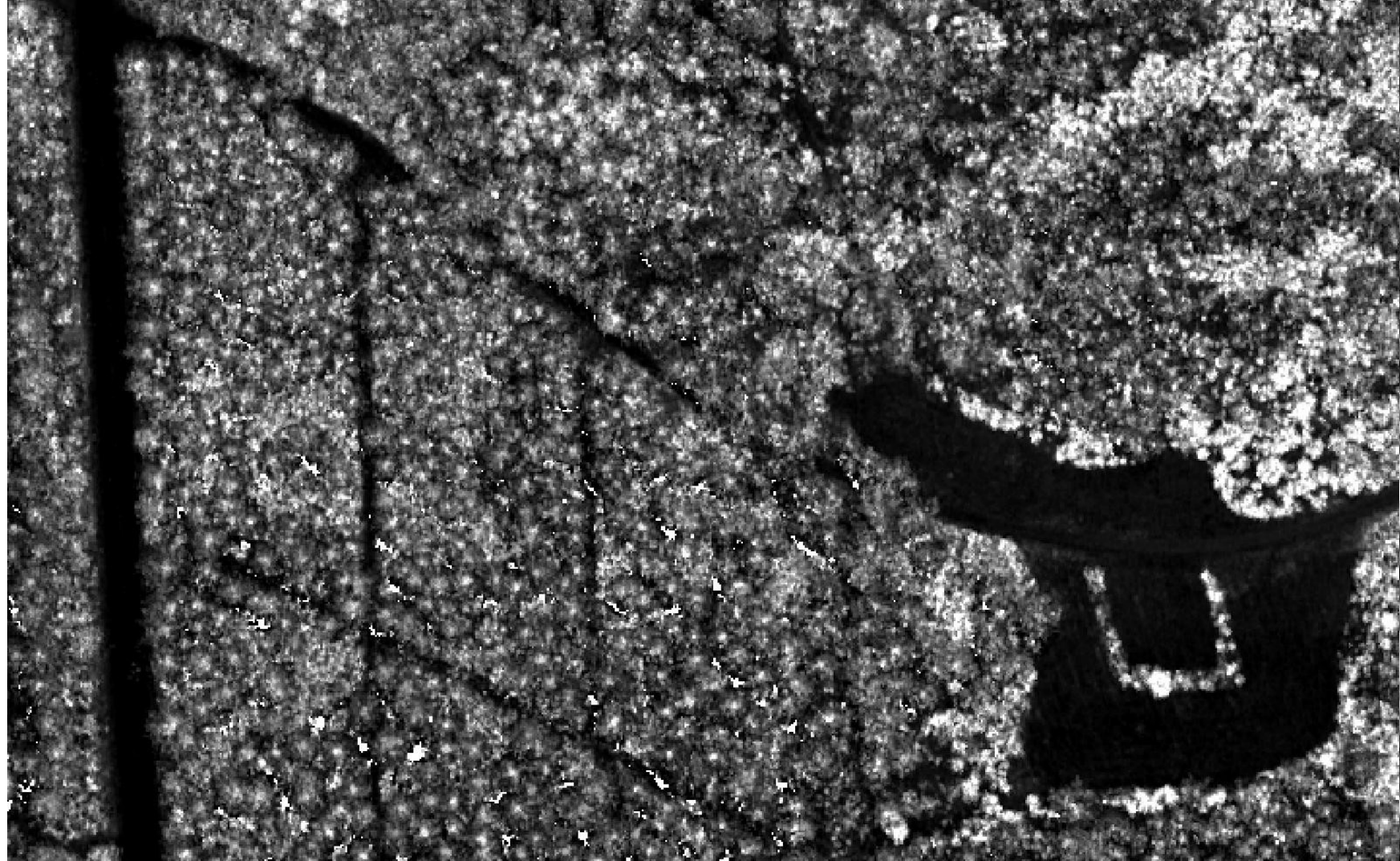
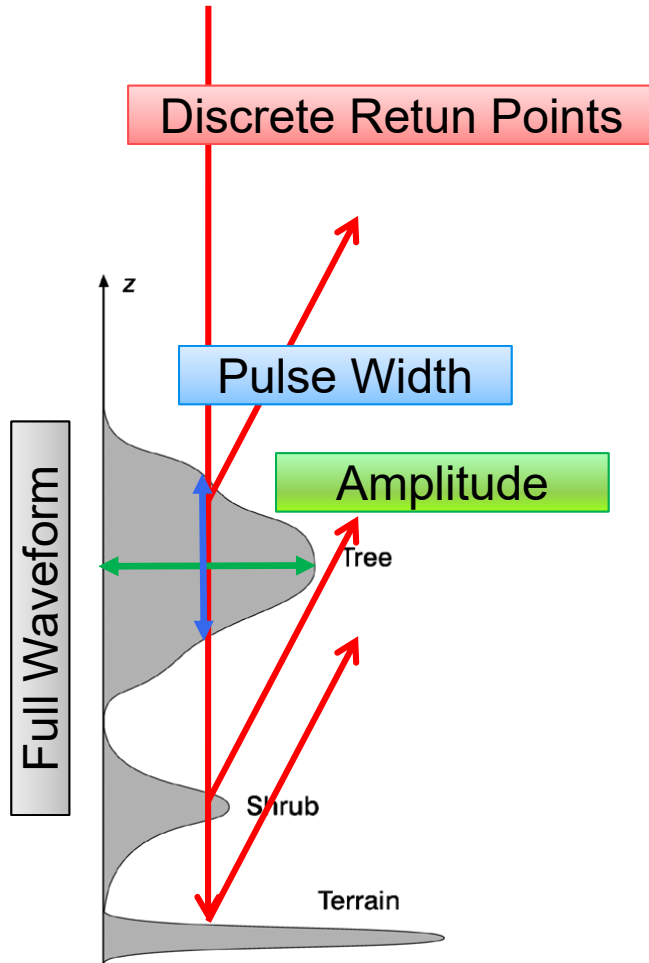
- ☐ Skærmkort
 - ☒ Ortofoto RGB
 - ☐ Ortofoto CIR
 - ☐ OSM grey
 - ☐ OSM
-
- ☒ LiDAR status
 - ☐ Flyvning ikke startet
 - ☐ Flyvning startet
 - ☐ Flyvning slut
 - ☐ Geometri kontrolleret
 - ☐ Klassifikation kontrolleret
 - ☐ Punktsky i kortforsyningen
 - ☐ OBS: klik på kort
 - ☒ Flyvning i dag
 - ☒ Aktive fly
 - ☐ Kommuner
 - ☐ Flyvning til dato

Point classes:

- 0 Created - never classified
- 1 Surface - processed but unclassified
- 2 Terrain - bare-earth ground**
- 3 Low vegetation 0-0,3 m**
- 4 Medium vegetation 0.3 – 2m**
- 5 High vegetation > 2m**
- 6 Buildings, houses, sheds, silos etc.**
- 7 Outliers
- 8 Model key points
- 9 Water Surface water**
- 10 Ignored points (breakline proximity)
- 17 Bridge deck All bridges**
- 32 manually excluded from surface points



Full Waveform / Extra Bytes



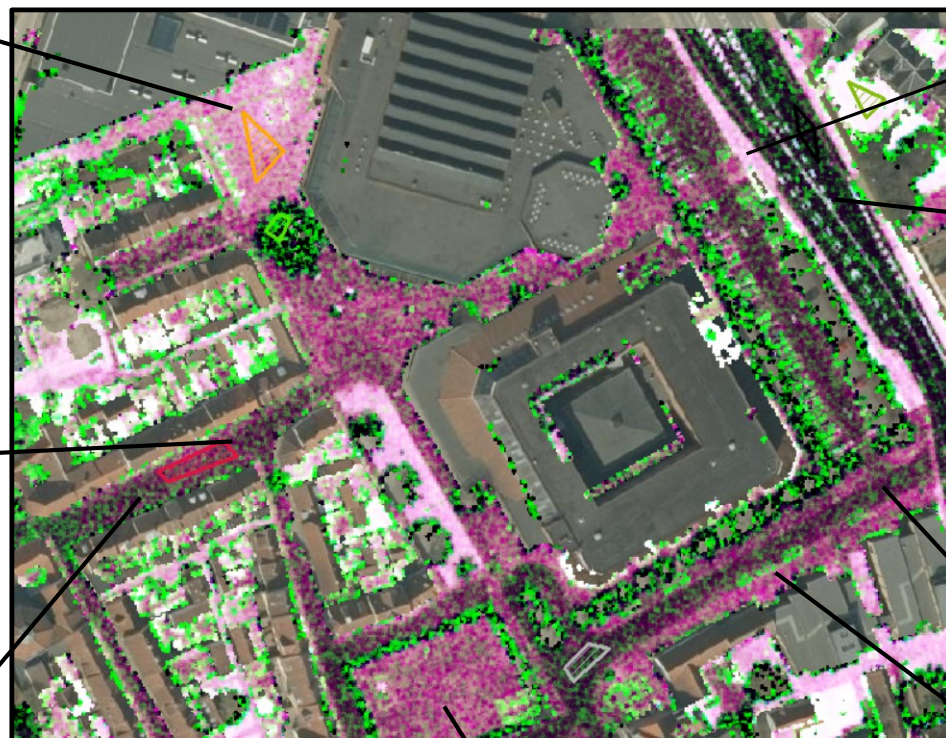
Deriving surface types



Small cobble stones

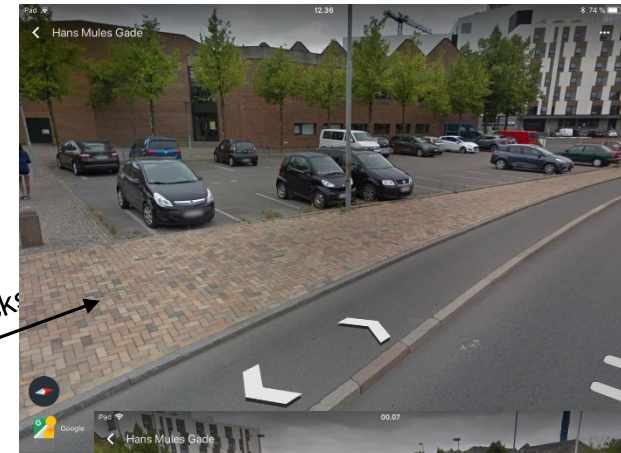


Large cobble stones



R - Amplitude
G - Puls width
B - Intensity

Small red bricks



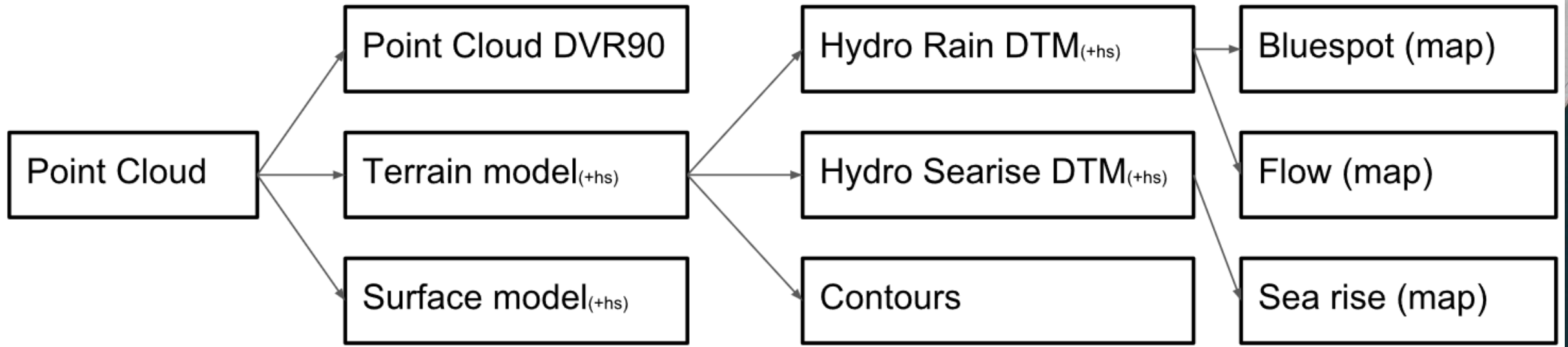
asfalt



Large regular
cobble stones

Large roads and
Small cobble stones

Elevation products in Denmark













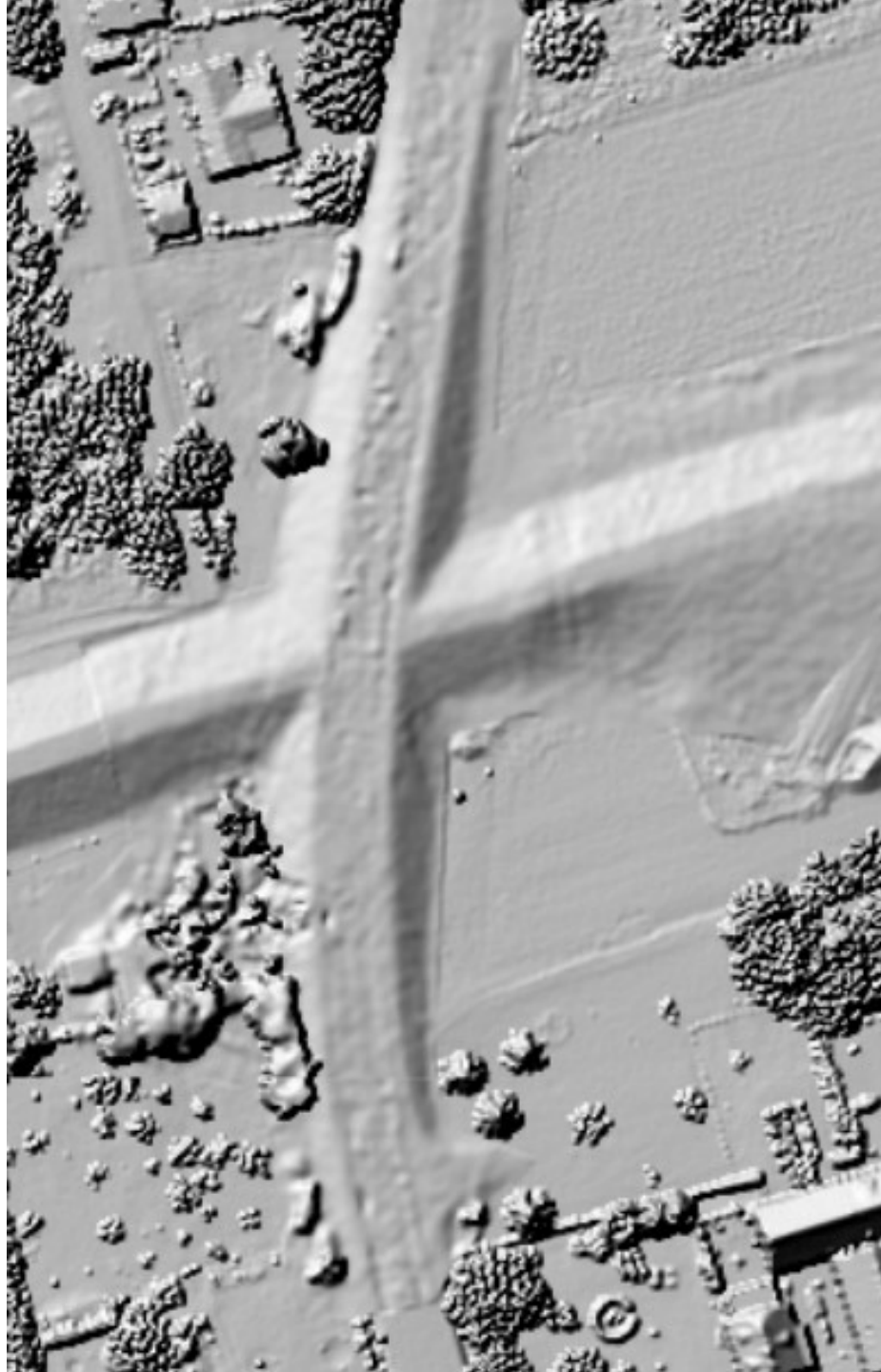
LiDAR

Precise but not accurate



Photogrammetry

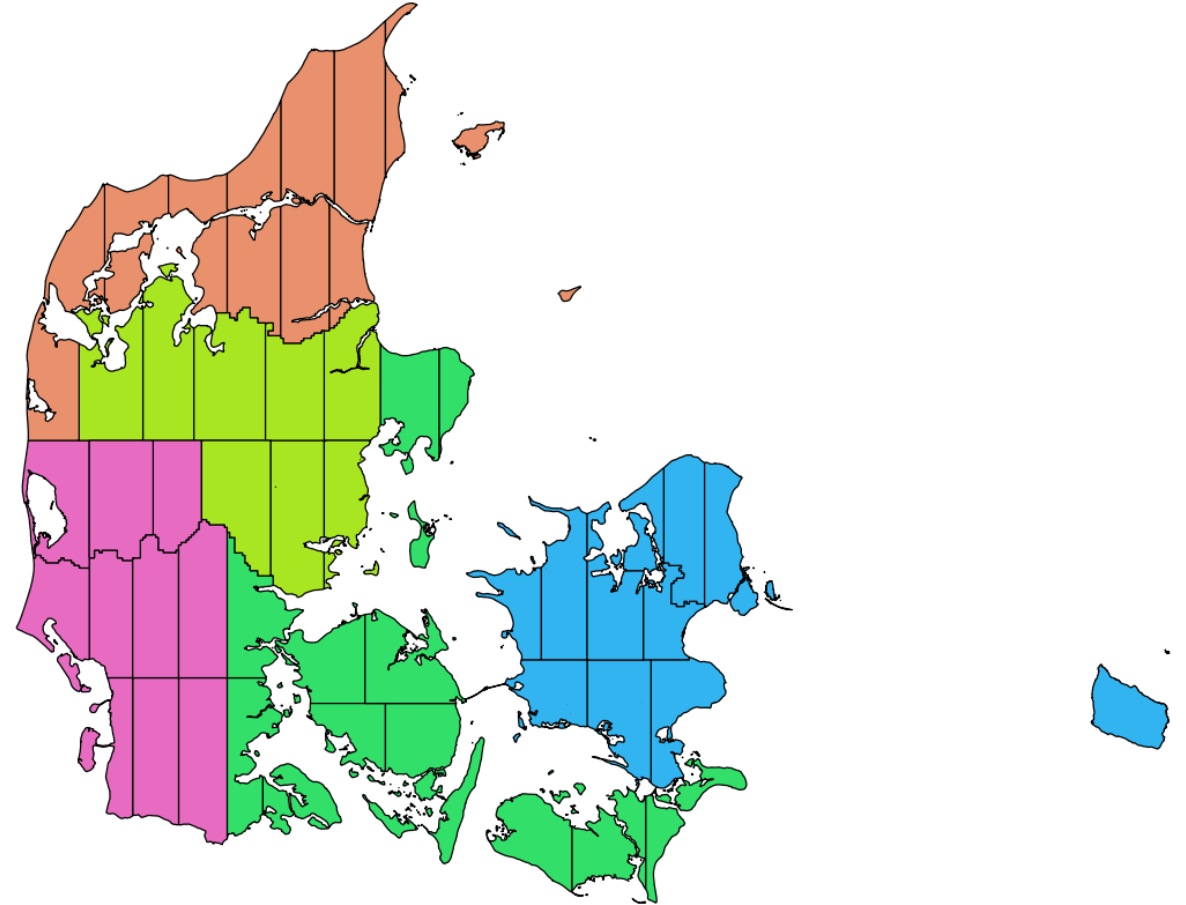
Accurate but not precise



Two products

Denmark's DEM

- Five year cycles (up to 5 years old)
- Homogeneous data i.e. all LiDAR
- Homogeneous precision
- Tiling 1x1km



*Quick DEM**

- *Updated ad-hoc (newer data)*
- *Different sources: photo, LiDAR, RADAR ..*
- *Inhomogeneous precision*
- *Tiling 1x1km (fully interchangeable with Denmark's DEM)*

* Under development - pending naming and final setup

Thank you for listening!



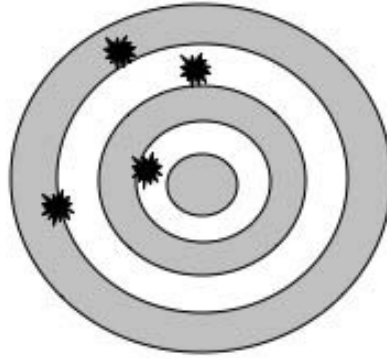
@DK_DHM



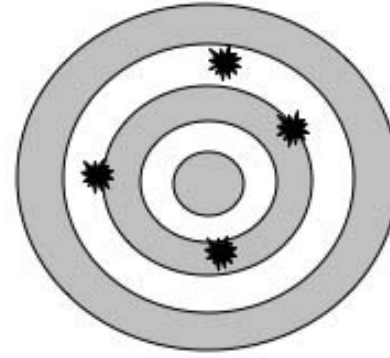
@SDFE_RS

Questions ?

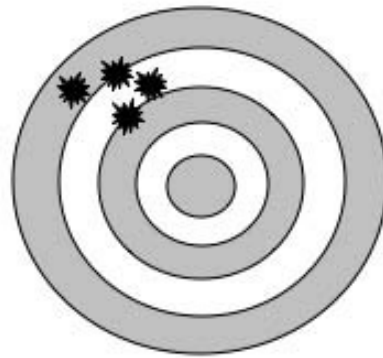
Precision vs. Accuracy



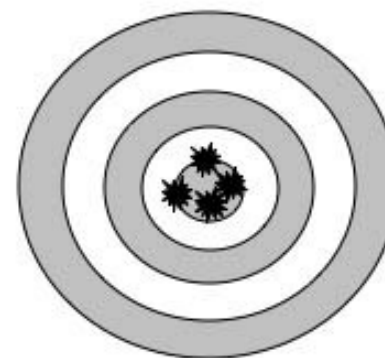
**Not Accurate
Not Precise**



**Accurate
Not Precise**



**Not Accurate
Precise**



**Accurate
Precise**