



Miljø- og
Fødevarerministeriet
Kystdirektoratet

Styrelsen for
Dataforsyning og
Effektivisering

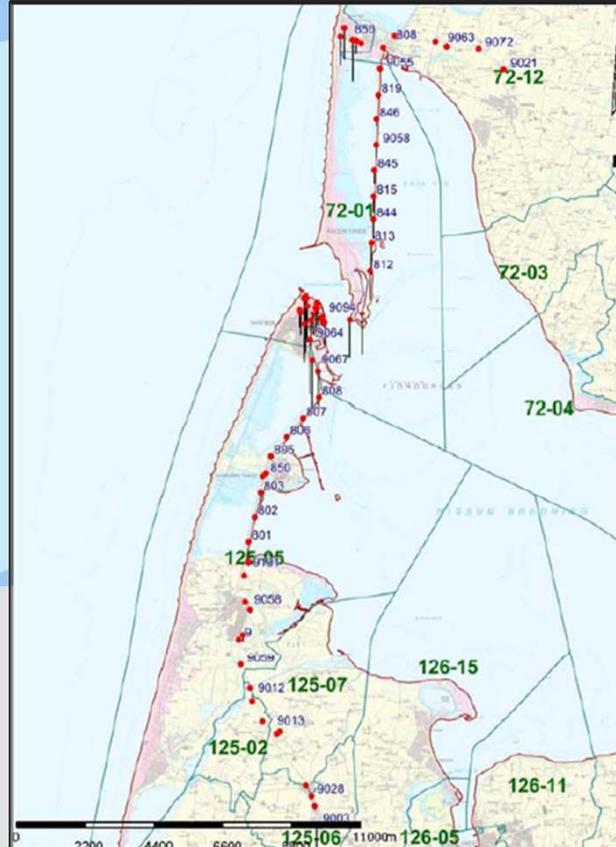
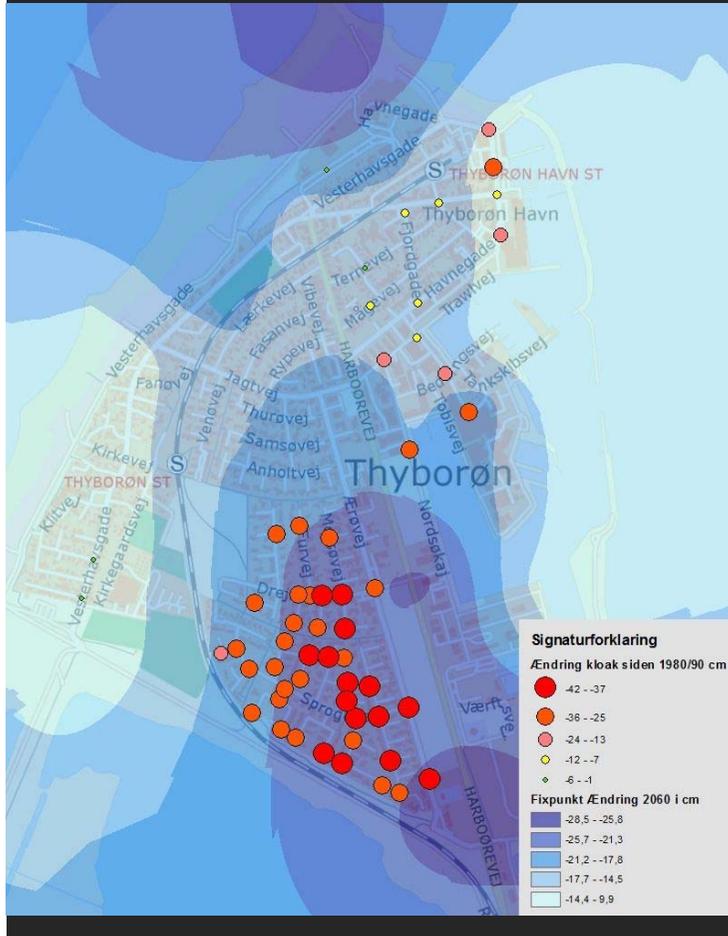
Satellitovervågning af sætninger

Carlo Sørensen, Karsten Vognsen, Niels Broge,
Joanna F. Levinsen & Per Knudsen



Borgermøde 'Klimatilpasning af Thyborøn', 12. juni 2017

Nivellementer i Thyborøn i 2006, 2009, 2012, 2015





Bygninger 'lagt ovenpå' 1917 kort



Year of construction

- 1770 - 1848
- 1849 - 1920
- 1921 - 1940
- 1941 - 1950
- 1951 - 1960
- 1961 - 1970
- 1971 - 1980
- 1981 - 1990
- 1991 - 2014

»If we can incorporate reliable information on land subsidence and uplift in our investment plans for the pipelines, we can focus the renovation activities where they are most needed and secure a functional network while reducing maintenance costs.«

*Lars Nørgård Holmegaard, CEO, LVS A/S
ESA Newsletter "Mapping that sinking feeling", 1 June 2016.*



"Thyborøn synker"

..

...

....

.....

Lavpraktisk arbejde hitter hos rumfarten



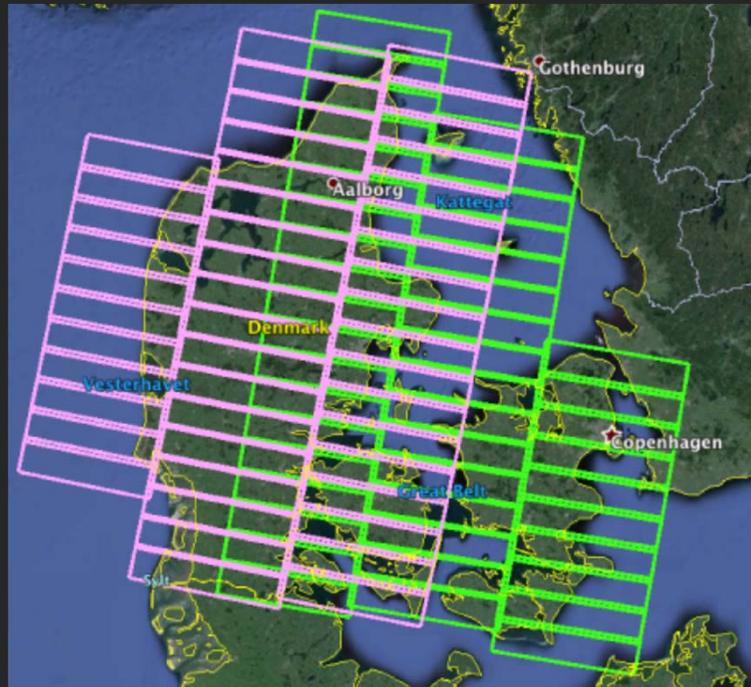
Af Jesper Lundsgaard, jelu@folkebladetlemvig.dk

Søndag den 5. juni 2016, 14:49

Lemvig Vand & Spildevand er citeret hos den europæiske rumfartsorganisation, ESA, for arbejdet med at benytte satellitter til at beregne levetiden for kloakker.

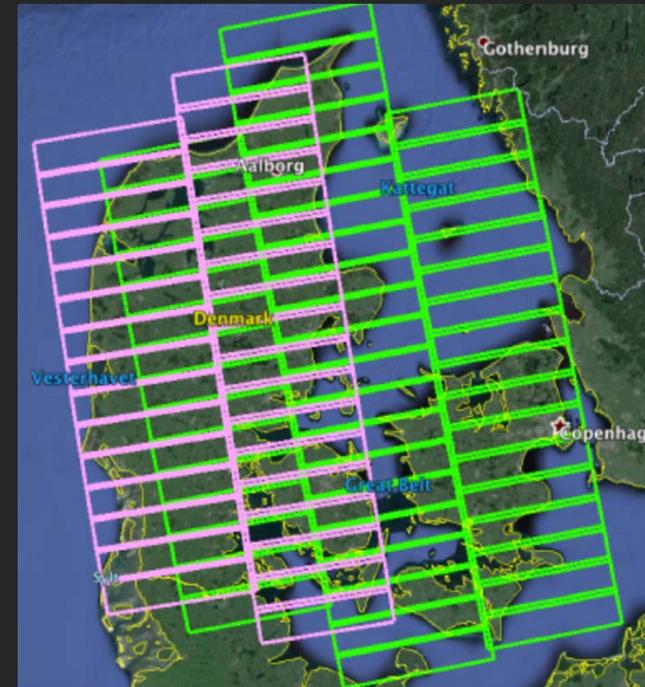


Sentinel-1 data over Danmark



Fuld dækning af Danmark med Sentinel-1
(Bornholm er dækket i eget spor)

DESCENDING TRACKS: 66 & 139



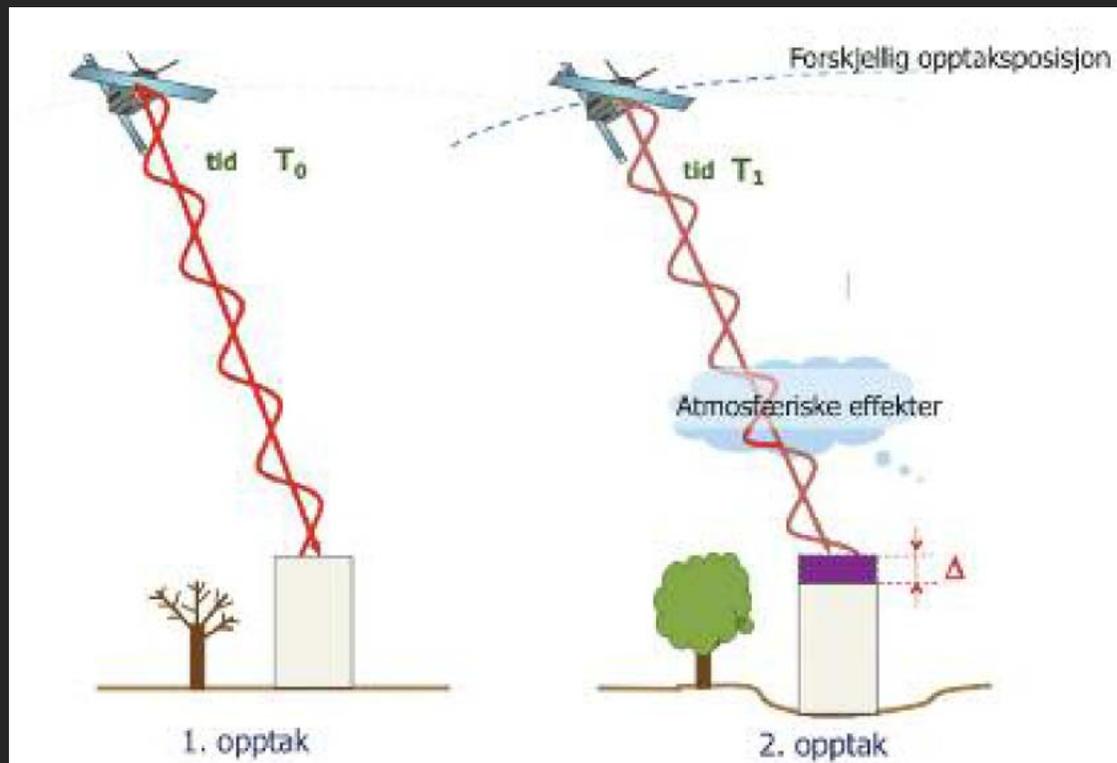
ASCENDING TRACKS: 44 & 117

Sentinel-1 data

- Tvillingsatellitter (S-1A og S-1B) Kommer forbi hver 6. dag;
- Pixel size = 5 x 20 m; Swath width = 250 km
- S-1 har høj datakvalitet og tidsopløsning
- Data er frit tilgængelige



Principles behind InSAR



NRS-rapport (2014)2, Norsk Rumcenter

Case: Thyborøn

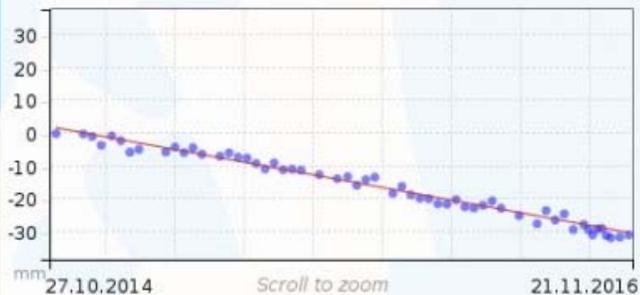
Thyborøn: 2014 – 2016

Tidsserie af et PSI punkt ved yderværk: Konstant rate af sætning.

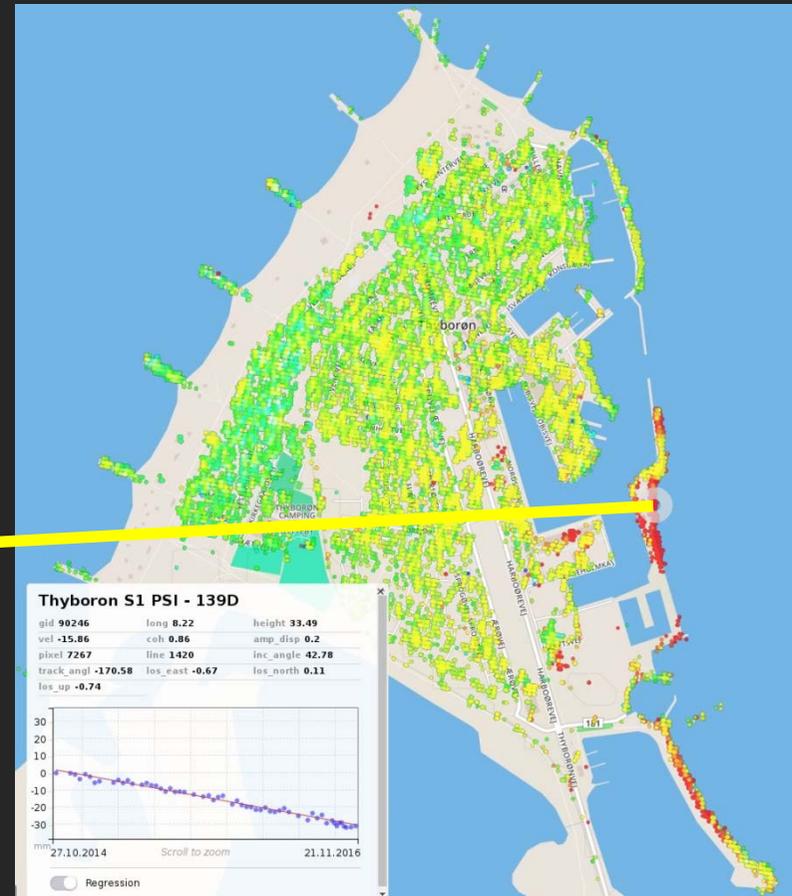
Hvert punkt indeholder oplysning om koordinater, hastighed, 'stabilitet af bevægelse' mv.

Thyboron S1 PSI - 139D

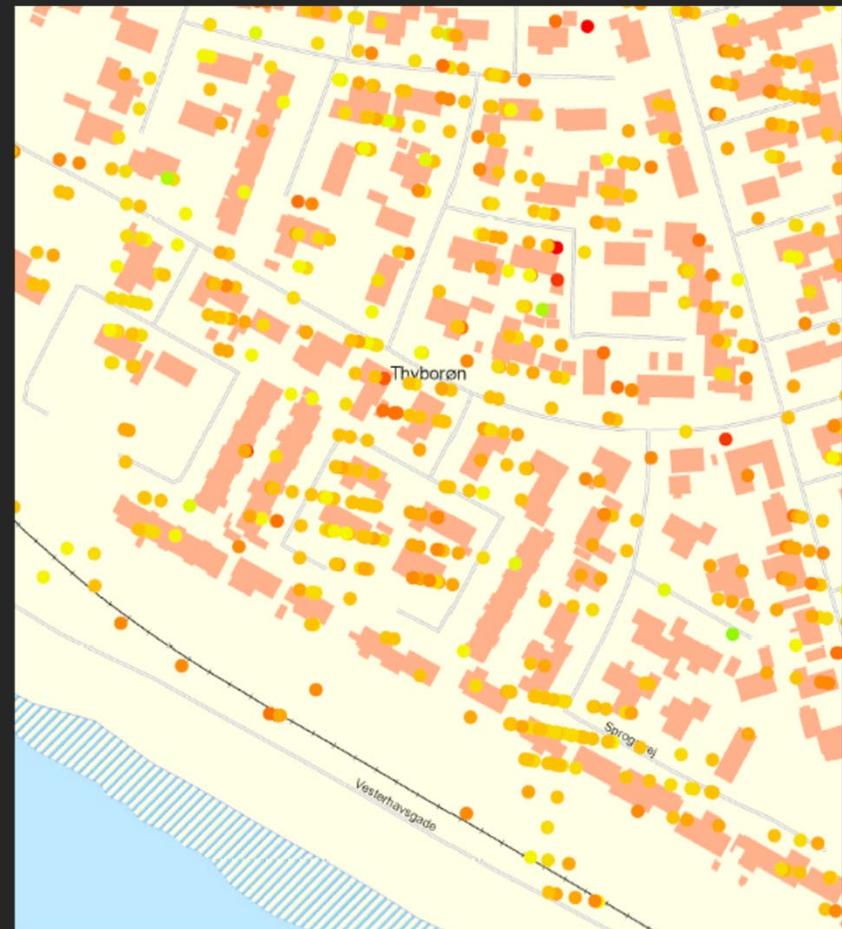
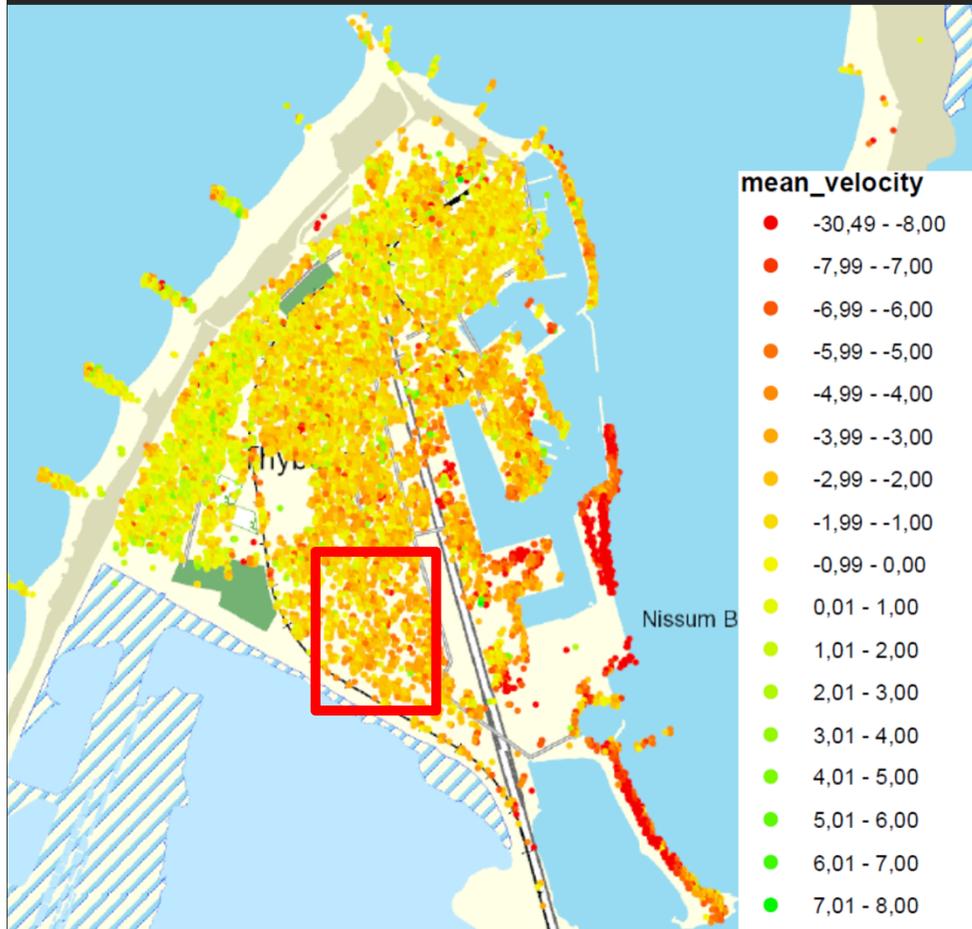
gid 90246	long 8.22	height 33.49
vel -15.86	coh 0.86	amp_disp 0.2
pixel 7267	line 1420	inc_angle 42.78
track_angl -170.58	los_east -0.67	los_north 0.11
los_up -0.74		

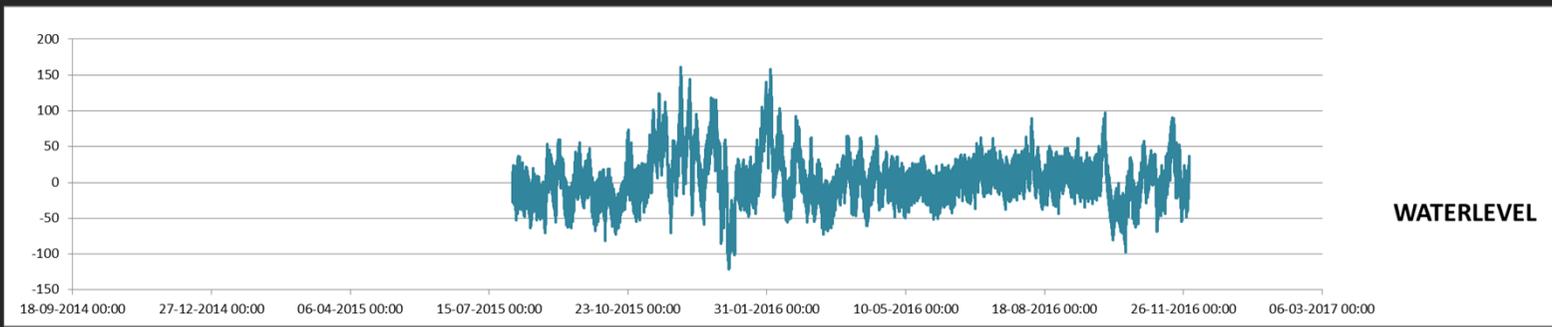
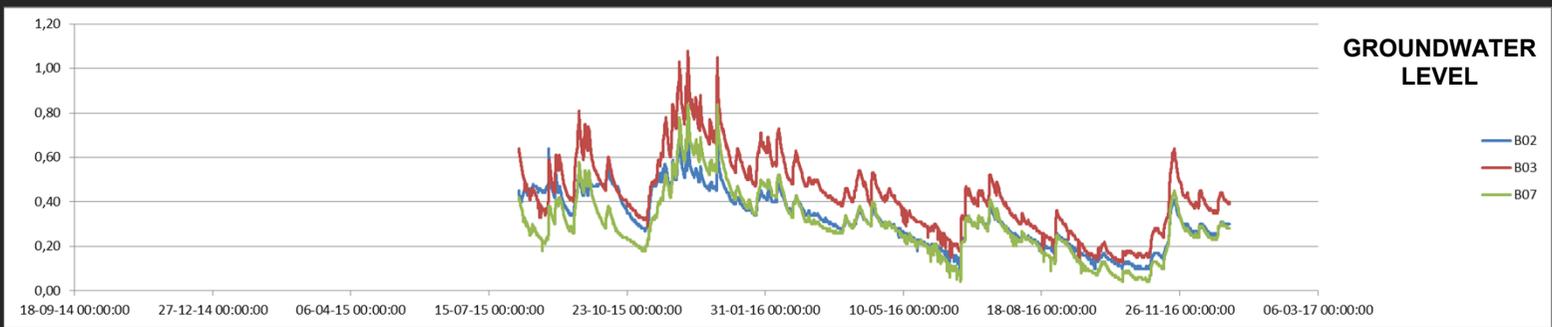
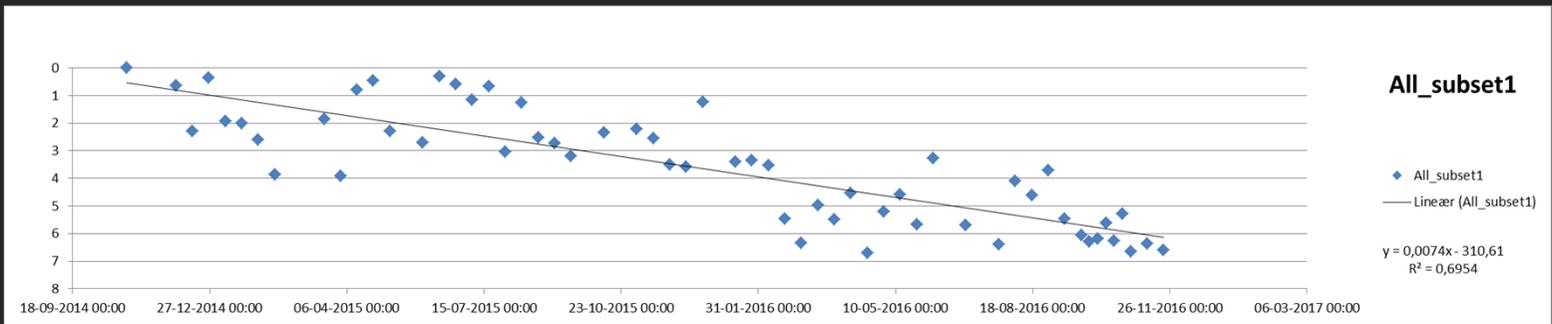


Regression

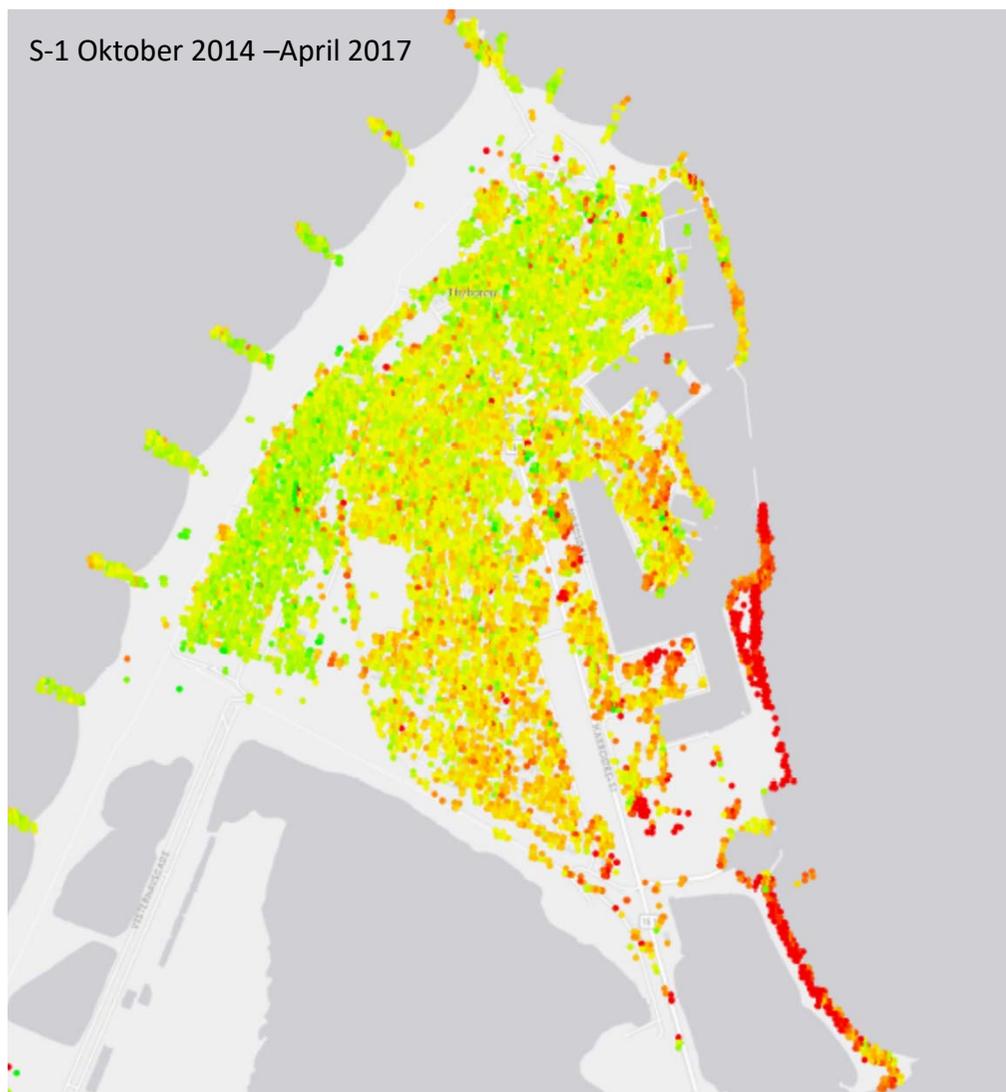


Case: Thyborøn (57 measurements Oct 2014 – Nov 2016)





S-1 Oktober 2014 –April 2017



Ændring mm/år

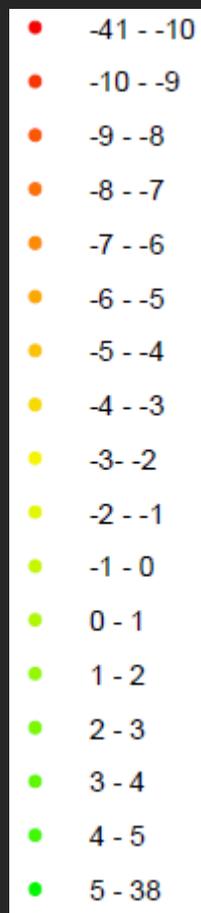


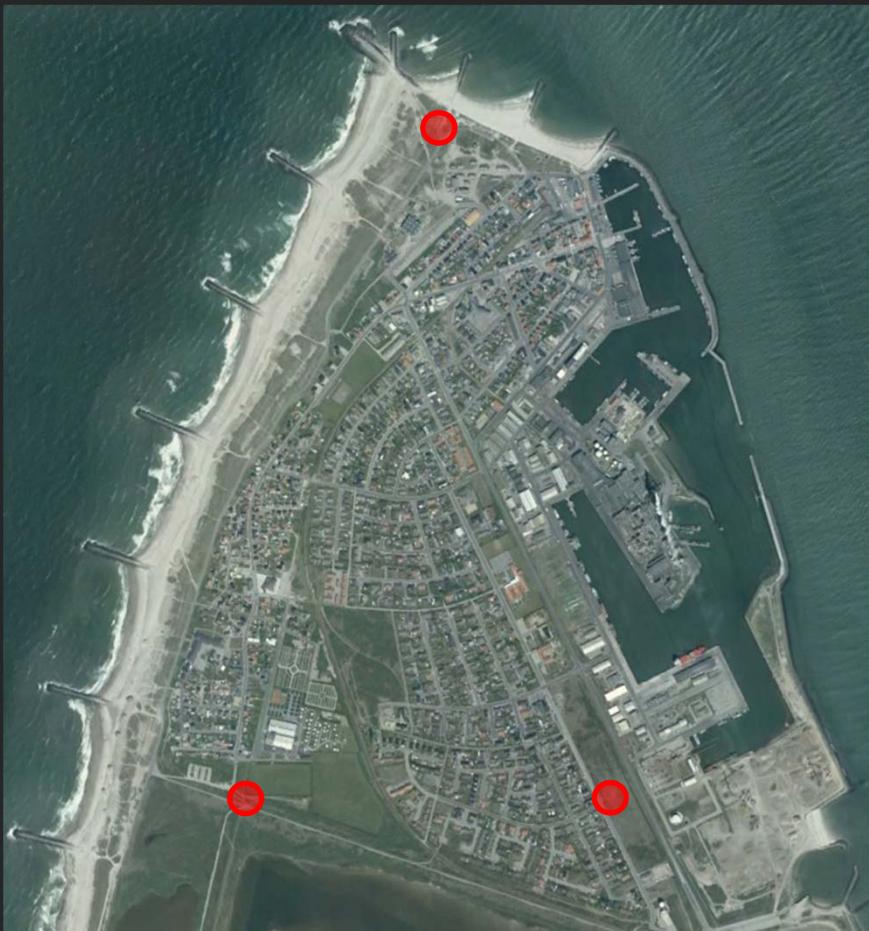


Foto: Benny Gade, De Bergske.



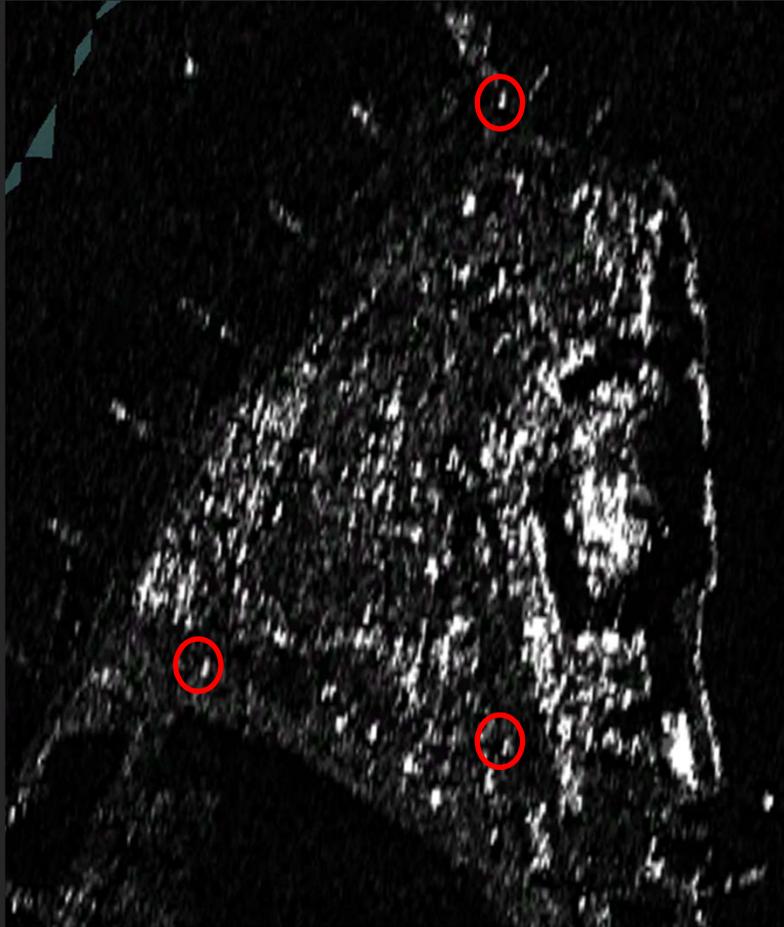
Foto: Benny Gade, De Bergske.

Hjørnereflektorer



Hjørnereflektorer

Reflektorer tydelige i satellitbilleder



Tak!

