

#### ICEFLOW: short-term movements in the Cryosphere

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# LIVING PLANET FELLOWSHIP CRYOSPHERE

#### Motivation - shorter intervals of Earth observation data



#### Motivation - optical remote sensing spectrum





from [Altena 2019, Observing the ice of our planet with daily cubesat imagery, IGF Research Reports]

# Opportunity





from [Altena 2019, Observing the ice of our planet with daily cubesat imagery, IGF Research Reports]

### Glacier velocity



glacier displacement generation is well established, and post-processing is now the bottleneck.



# Glacier velocity from multiple satellite data-sets

eesa

Sentinel-2, Landsat7, Landsat8 (GoLIVE), RapidEye, ...





### Glacier velocity from multiple satellite data-sets



East Chugach mountains (Alaska), 2013-2018 on quarterly intervals at 300m

see also: [Altena, et al. 2019] Extracting recent short-term glacier velocity evolution over southern Alaska and Yukon from a large collection of Landsat data, TC

# Resolving velocity in complex glacier flow



# Resolving velocity in complex glacier flow,



current approaches are unable to resolve ice-fall velocity





high resolution (30m) velocity field



### Daily cubesat imagery from the Planet constellation



Planet at a glance (youtube)

# Frazil or pancake ice movement





[Kääb, Altena & Mascaro. 2019], River ice and water velocities using the Planet optical cubesat constellation, HESS

#### Freeze-up tetris



#### Satellites overpass at different times of day





# Discharge of Lena river





data from: arcticgreatrivers.org

# River infrastructure monitoring



the possibility of a service from open EO data





**Planet Doves** 

Sentinel-2



2 satellites, 5 day revisit

150+ satellites, 1 day revisit

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Bas Altena, project Iceflow

### Displacements at different timescales







#### never done before

of interest for fishery, navigation, ...

 $\leftarrow \textit{fjord ice}$ 



# Thanks for your attention



and thanks to the people at ESA for supporting this project!