Supplementary of

Remote Sensing of Environmental Changes in Cold Regions: Methods, Achievements and Challenges

Table S1. Overview of satellite missions/sensors for cold land remote sensing and summarized in the review

Mission/sensor	Footprint size	Mission/sensor	Footprint size
Microwave radiometer		**Optical-IR sensors**	
SMMR	up to 27km x 18km	MODIS	250-1000m
SSM/I(S)	up to 15km x 13km	Landsat/TM	30m
AMSR-E	up to 6km x 4km	Landsat/OLI	30m
AMSR2	up to 5km x 3km	Sentinel-2	10-20m
FY/MWRI	up to 15km x 9km	AVHRR	1.1km
SMOS	~42km	TERRA/ASTER	15m
SMAP	39km x 47km	IKONOS	1m
Aquarius	up to 62km x 68km	Planet CubeSat	0.8m -5m
Radar		WorldView-2	0.46m
ASCAT	25-50km	GOME-2	80 km x 40 km
Aquarius	up to 76km x 94km	OCO2	1.29km × 2.25km
ERS1/SAR	6-30m	GOES	1 – 4 km
ERS2/SAR	6-30 m	FY2	1.25 -5 km
RADARSAT-2	1 - 100 m	METEOSAT−8	3 km
RCM	1 - 100 m	Himawari 8/9	0.5 – 2 m
ENVISAT/ASAR	30 -1000m		
ALOS/PALSAR	7 -100m	**LIDAR**	
ALOS2/PALSAR2	1 -100m	ICESAT/ GLAS	~70m
TerraSAR-X	1 - 16 m	ICESat2/ ATLAS	17m
Sentinel-1A/B	5 - 40m		
Cryosat2/ SIRAL-2	250m (along-track)	**Gravimetric satellite**	
*BIOMASS	60 m x 50 m	GRACE	~330 km
*NISAR	100m	GRACE-FO	~330 km
*SWOT	10 ~ 60 m x 6 m		

*scheduled missions

Table S2. Vertical accuracy of DEMs from different sensors and methods over glacier surface

Satellite	Sensor	Vertical accuracy over glacier surface
ICESat	GLAS	point measurement: 15 cm. Averaged ice elevation changes≤ 1 cm
ICESat-2	ATLAS	≤ 0.25 m/yr over areas of 100 km^2 for year-to-year averages
Cryosat-2	SIRAL-2	bias ≤50 cm in the interior of the ice sheet
TERRA	ASTER	~ 11 m for photogrammetric processing
IKONOS	IKONOS	< 5m for photogrammetric processing
ERS-1/2	SAR	~10-20 m for INSAR generated DEM
ENVISAT	ASAR	~10-20 m for INSAR generated DEM