Operational snow cover monitoring in Central Asia

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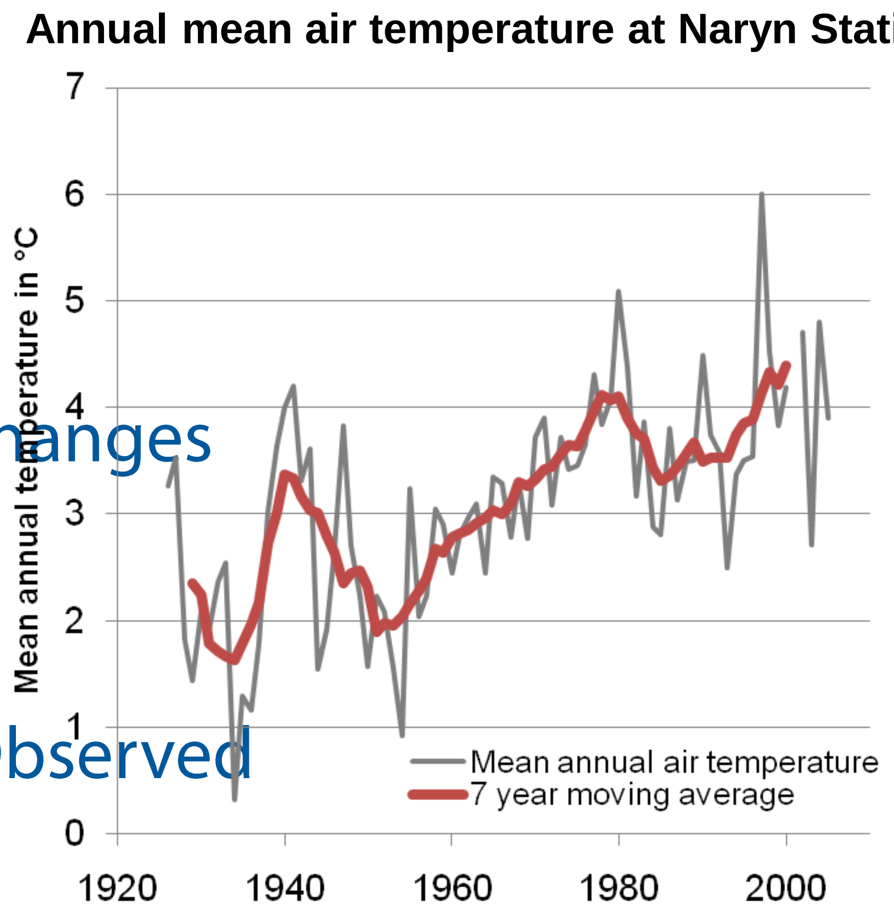
A hotspot for climate change

changes

Observed



From: SNC of Tajikistan to UNFCCC, 2008

Precipitation?

Seasonal snow pack?

Glacier mass balances?

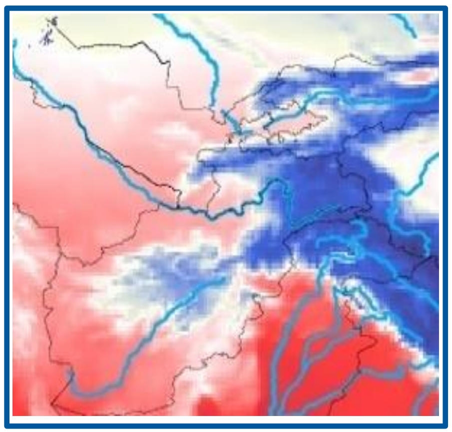
Spatial extent?

Extreme events?

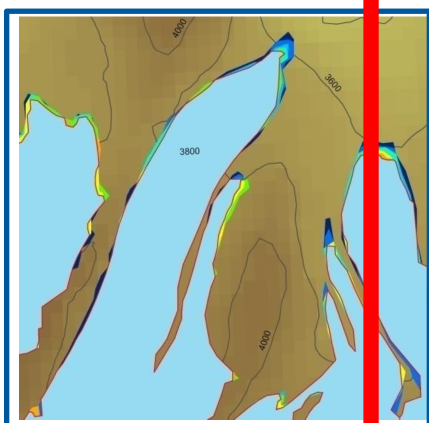
How much water will be available?

Modeling climate change impact on water availability up to year 2100:

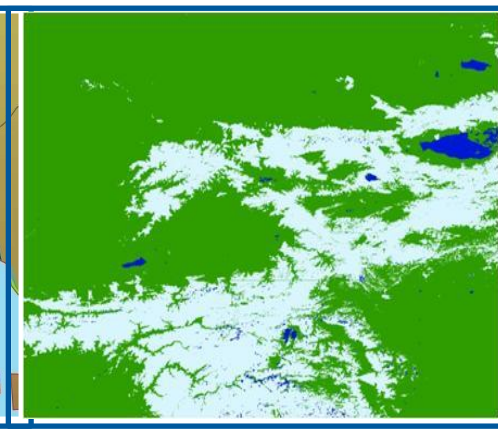
Regional climate model



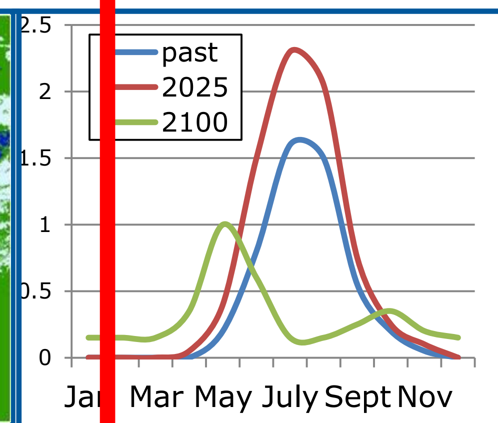
Glacier mass balances



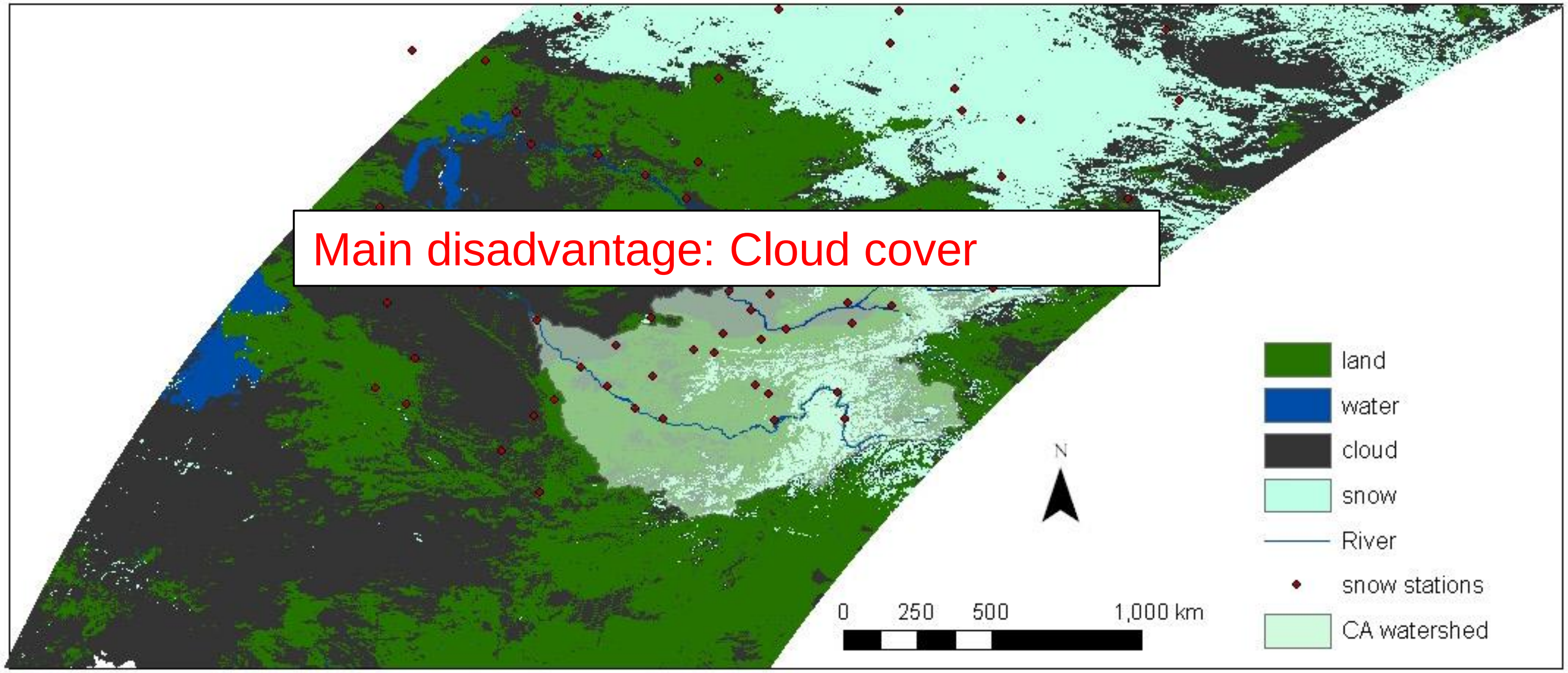
Snow cover monitoring



Hydrologic model



Remotely sensed snow cover monitoring



- Spatial resolution – 500m
- Temporal resolution - daily

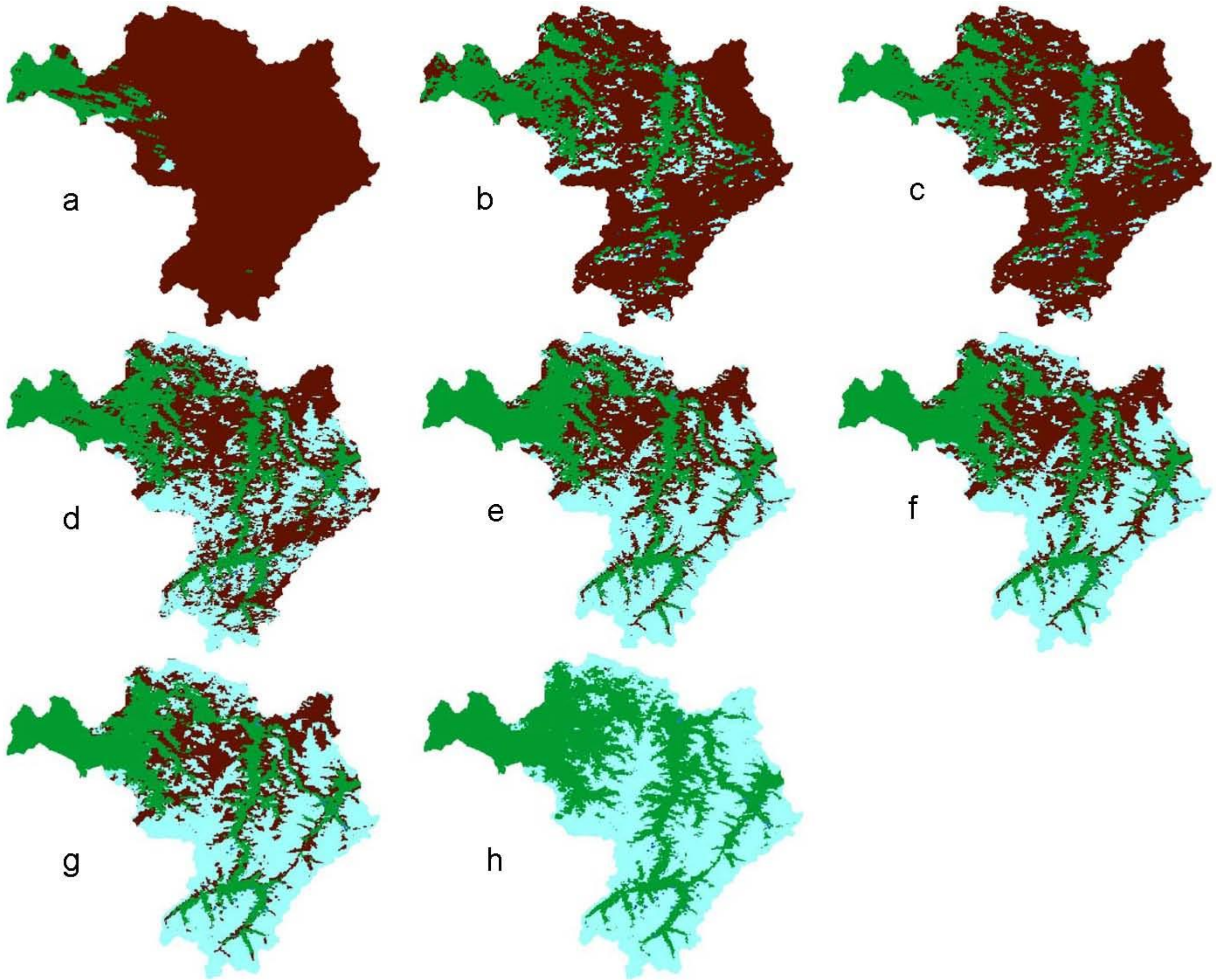
Gafurov, A., Kriegel, D., Vorogushyn, S., Merz, B. 2013. Evaluation of remotely sensed snow cover monitoring in Central Asia. *Hydrology Research*, 44.3, 506-522

Author	Accuracy	Region	Years
Parajka, et al	95 %	Austria	2006
Klein, et al	88 %	USA	2003
Wang, et al	94 %	China	2008
Hall, et al	93 %	USA	2007
Ault, et al	92 %	USA	2006
Tekeli, et al.	82 %	Turkey	2005
Gafurov, et al.	92 %	Central Asia	2013

ModSnow algorithm

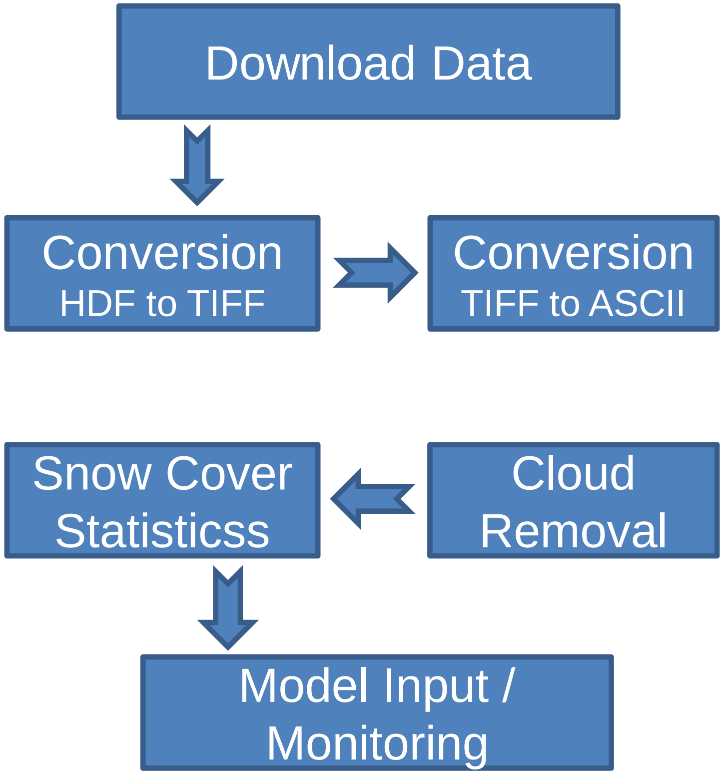
ModSnow (Gafurov et al., 2009) – removes cloud covered pixels from MODIS original cloud obscured data and estimates actual pixel cover for each region

- Consists of six subsequent steps
- Accuracy ~ 90 % (last version)

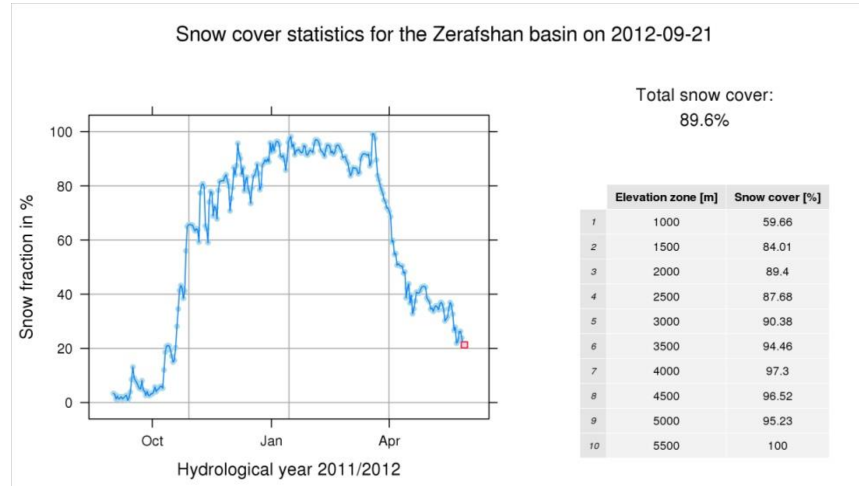


Gafurov, A., Bárdossy A. 2009. Cloud removal methodology from MODIS snow cover products. *Hydrology and Earth System Sciences*, 13, 1-13

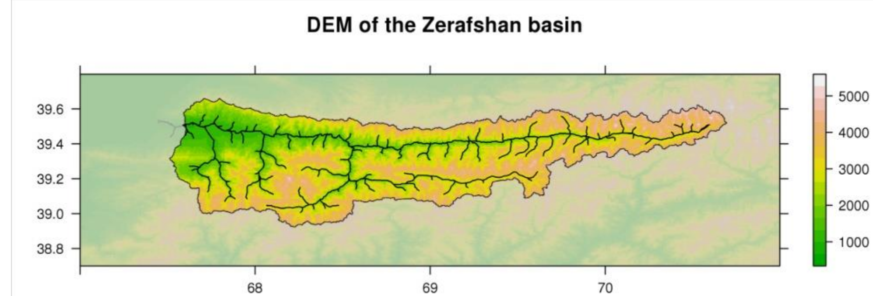
Near real time, automatic, stand alone snow monitoring tool

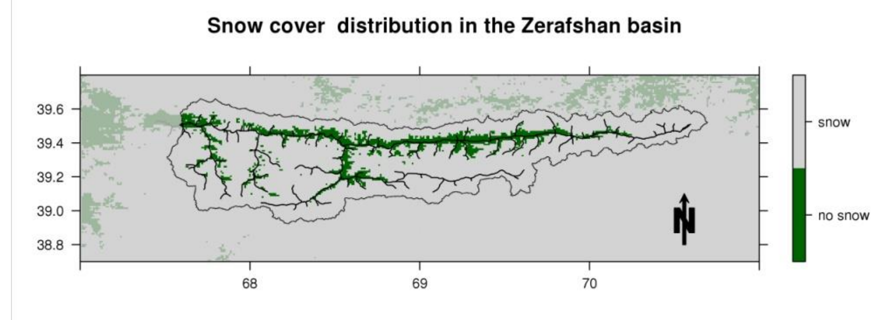


- Implemented and in operation at Uzhydromet, Kazhydromet, Turkmen Hydromet and CAIAG
- Implementation at Kyrgyzhydromet planned for early 2014



	Elevation zone [m]	Snow cover [%]
1	1000	59.66
2	1500	84.01
3	2000	89.4
4	2500	87.68
5	3000	90.38
6	3500	94.46
7	4000	97.3
8	4500	96.52
9	5000	95.23
10	5500	100





Summary

- Hydrological studies in Naryn, Karadarya, Zerafshan and Ala-Archa basins (CAWa project study areas)
- Multi-objective calibration of hydrological model WASA (Discharge, Glacier Mass Balance, Snow Cover Extent)
- Seasonal water availability studies planned in cooperation with CAIAG
- Currently Modsnow results are being integrated into AISHF hydrological model (main hydrological model used in CA countries for short term water availability forecast)

Thank you!