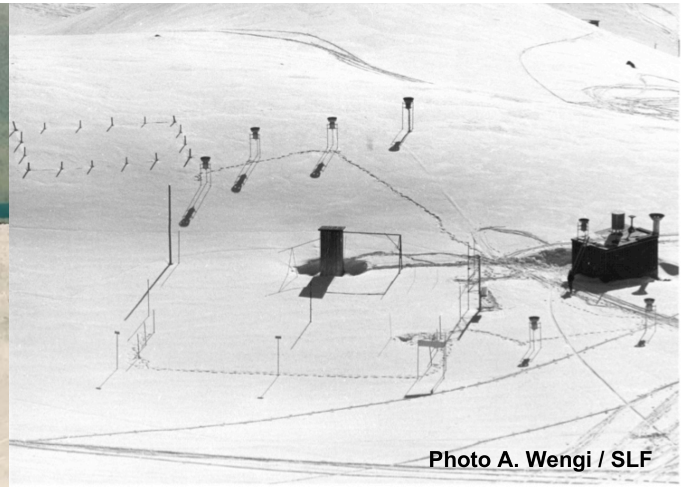



Global Cryosphere Watch & SPICE
An Update

Ingrid Senn & Charles Fierz, WSL / SLF Davos

HarmoSnow field campaign, Erzurum, Turkey, 1-3 March 2016

Measurement Standards and Best Practices

GCW standards and best practices for cryospheric measurements are currently being compiled. GCW is drawing on existing measurement methods where possible and where a scientific consensus has been or can be reached. An initial inventory of existing documents describing measurement practices is given below.

Cryosphere Element	Existing Documents
Snow	CEN (2010), Fierz et al. (2009), Armstrong et al. (2009), MSC (2012, 2013), UNESCO, IASH and WMO (1970)
Glaciers, ice sheets, ice caps	Kaser et al. (2003), Östrem and Brugmann (1991), Paul et al. (2009), UNESCO and IASH(1970a), UNESCO and IASH (1970b), WGMS (2012), Zemp et al. (2009)
Sea ice	JCOMM (2004), MSC (2005), NOAA (2007), WMO (2004), Johnson and Timco (2008)
Solid precipitation	Goodison et al. (1998), MSC (2012, 2015), Nitu and Wong (2010), WMO (2012)
Permafrost	Smith and Brown (2009), GTN-P (2012)

References

Armstrong, R., K. Steffen, M. Monteduro, and R. Sessa, 2009, Assessment of the status of the development of the standards for the Terrestrial Essential Climate Variables – T5 - Snow. Global Terrestrial Observing System GTOS-60, Rome.

CEN (European Committee for Standardization), 2010, Hydrometry - Measurement of snow water equivalent using snow mass registration devices. CEN/TR 15996:2010, Brussels.

Fierz, C., Armstrong, R.L., Durand, Y., Etchevers, P., Greene, E., McClung, D.M., Nishimura, K., Satyawali, P.K. and Sokratov, S.A. 2009, The International Classification for Seasonal Snow on the Ground. IHP-VII Technical Documents in Hydrology No. 83, UNESCO-IHP, Paris. 90 pp.

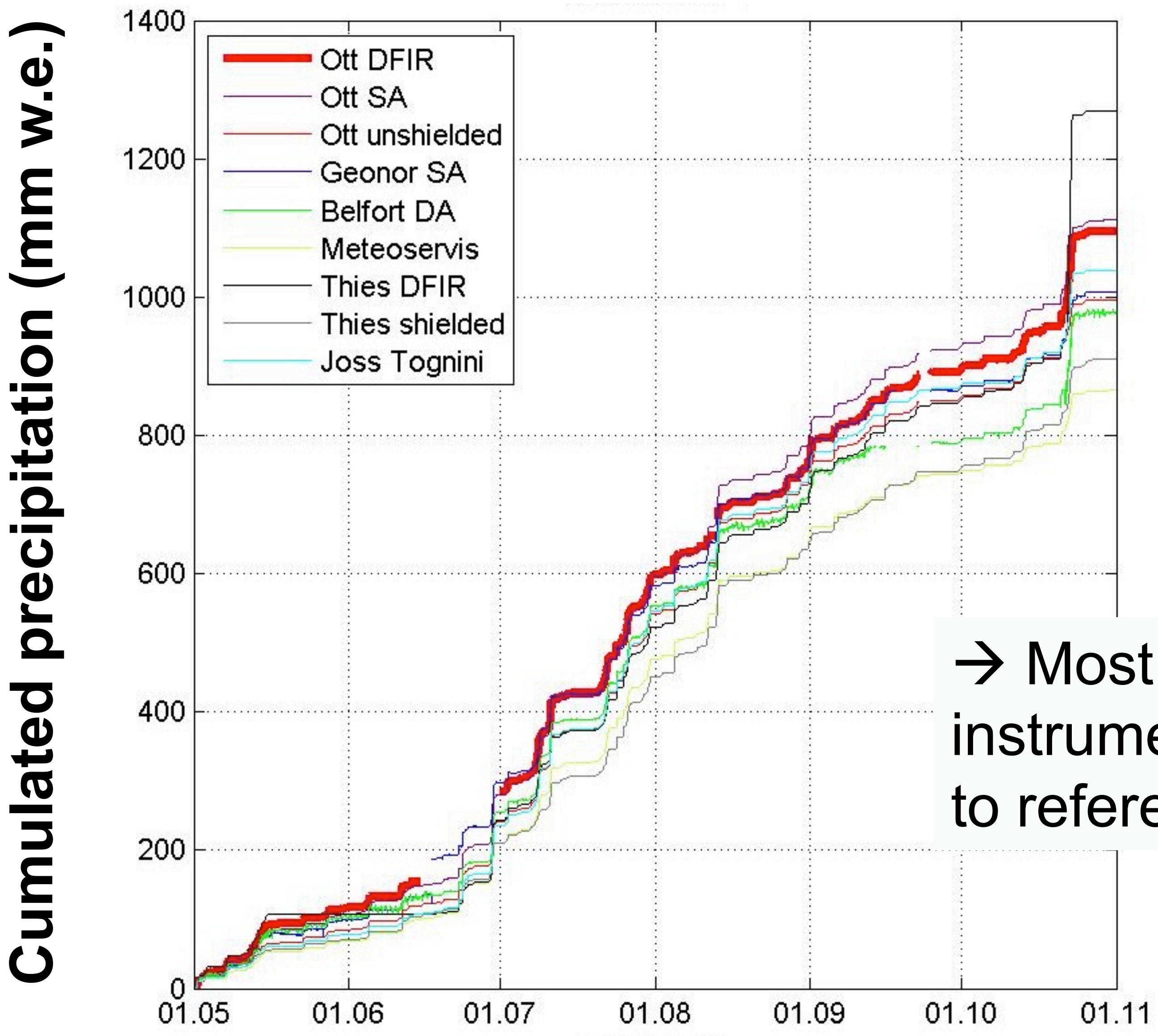
Goodison B.E., P.Y.T. Louie, D. Yang, 1998, WMO Solid Precipitation Measurement Intercomparison- Final Report, WMO/TD - No. 872.

SLF

WSL

SPICE @ Weissfluhjoch, 2540 m a.s.l.

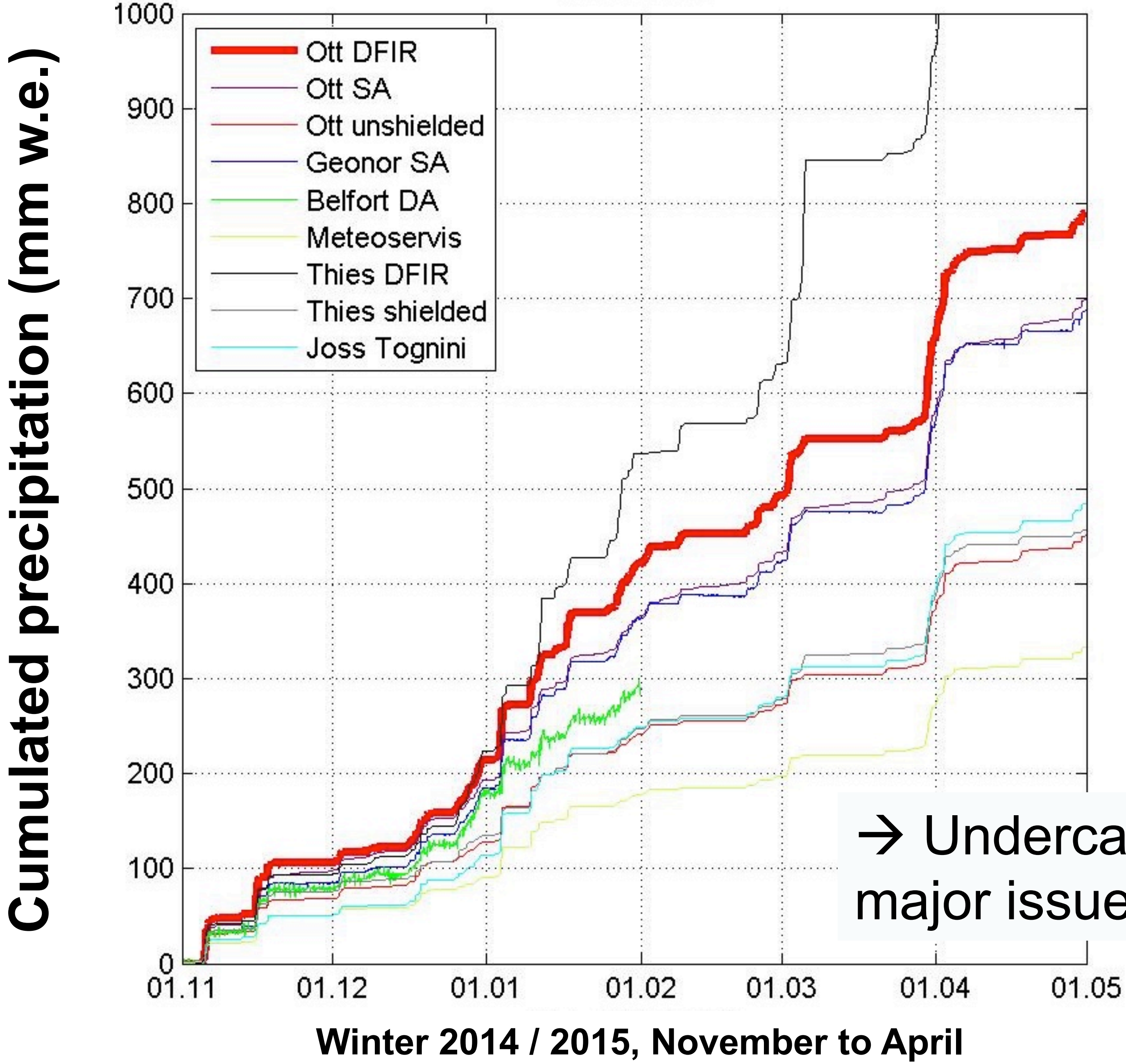
Cumulative sum – liquid precipitation



Summer 2014, May to October

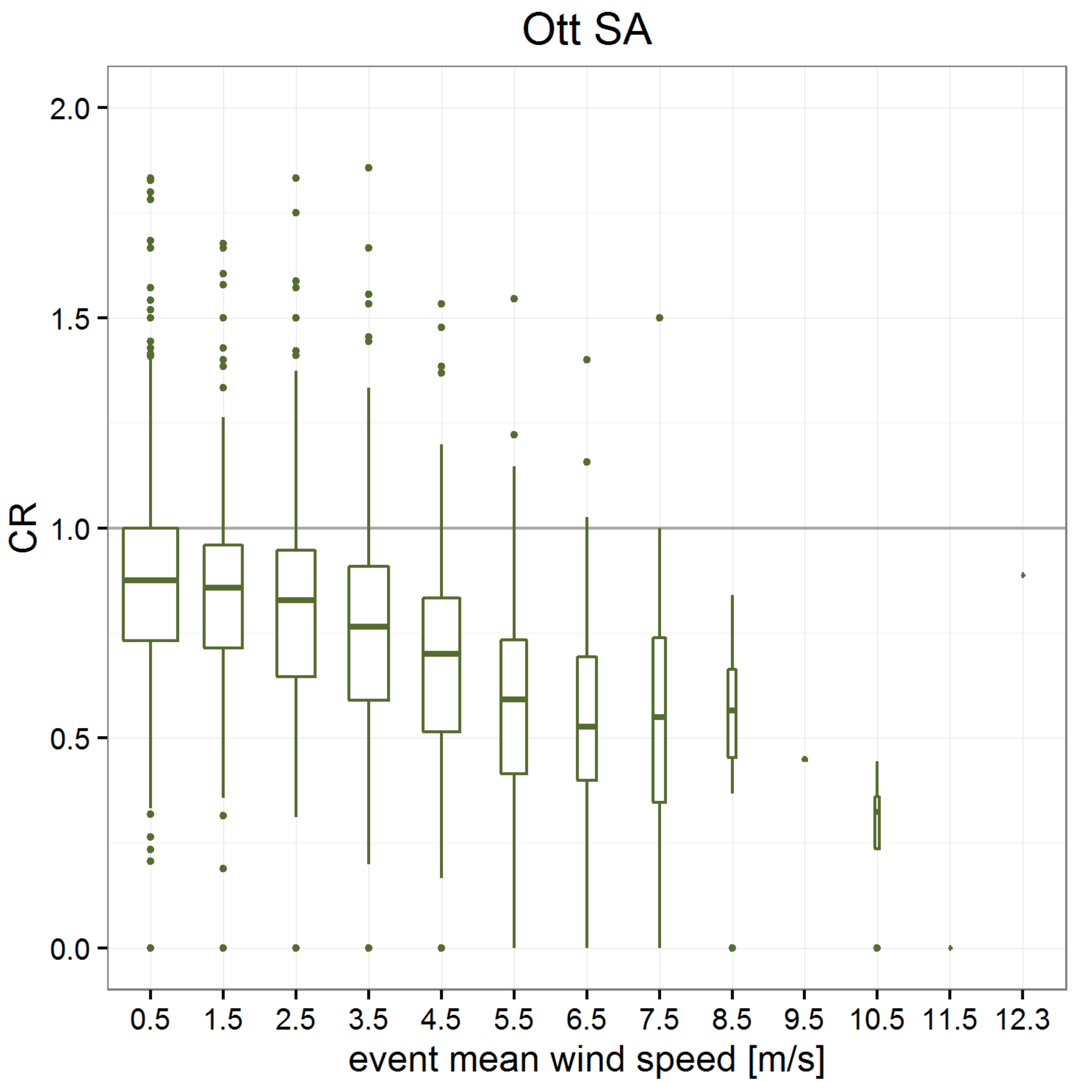
→ Most instruments close to reference

Cumulative sum – solid precipitation



→ Undercatch is a major issue!

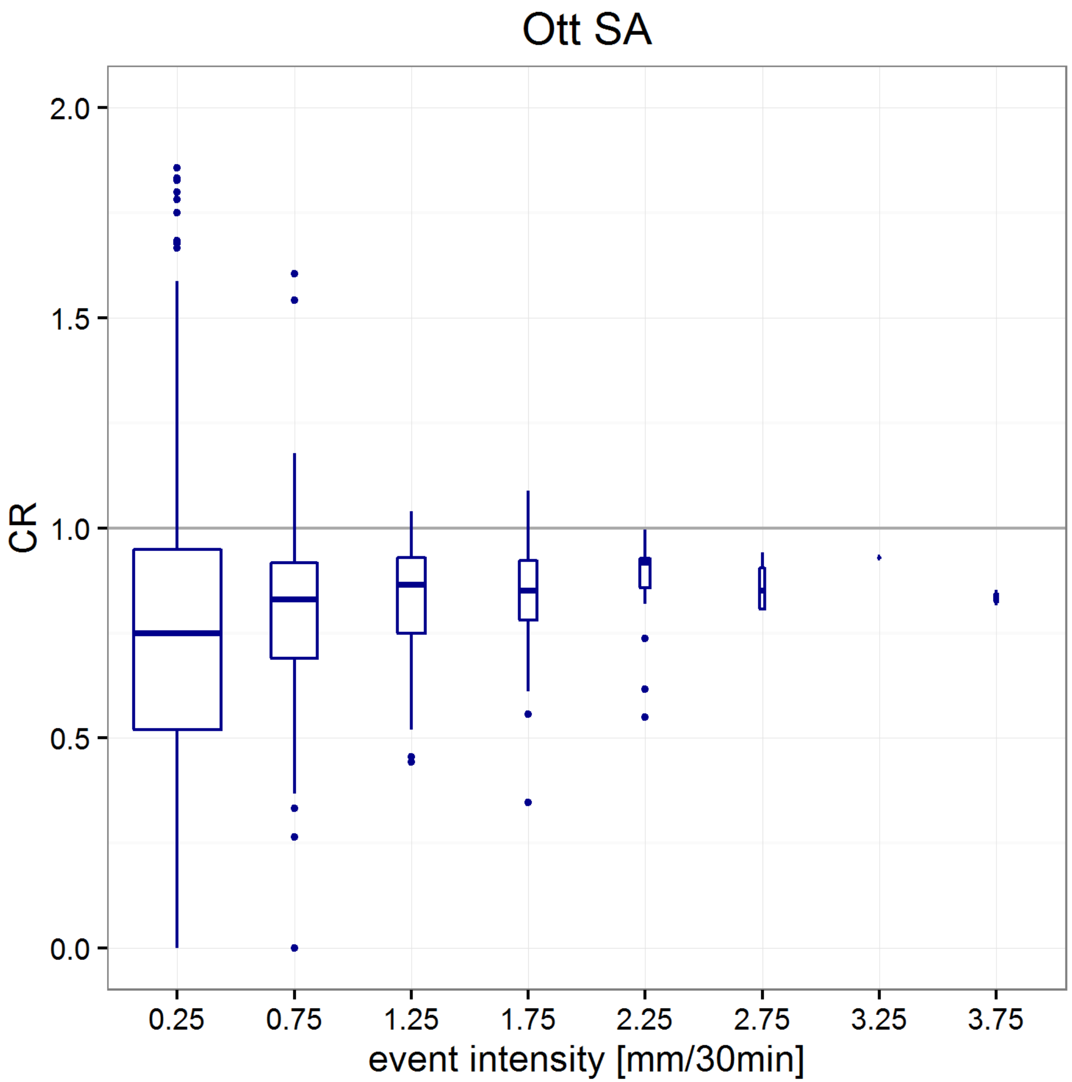
Catch ratio vs wind (solid precip)



→ Undercatch gets stronger for stronger winds.

Data: Nov-April 2014 & Nov-April 2015

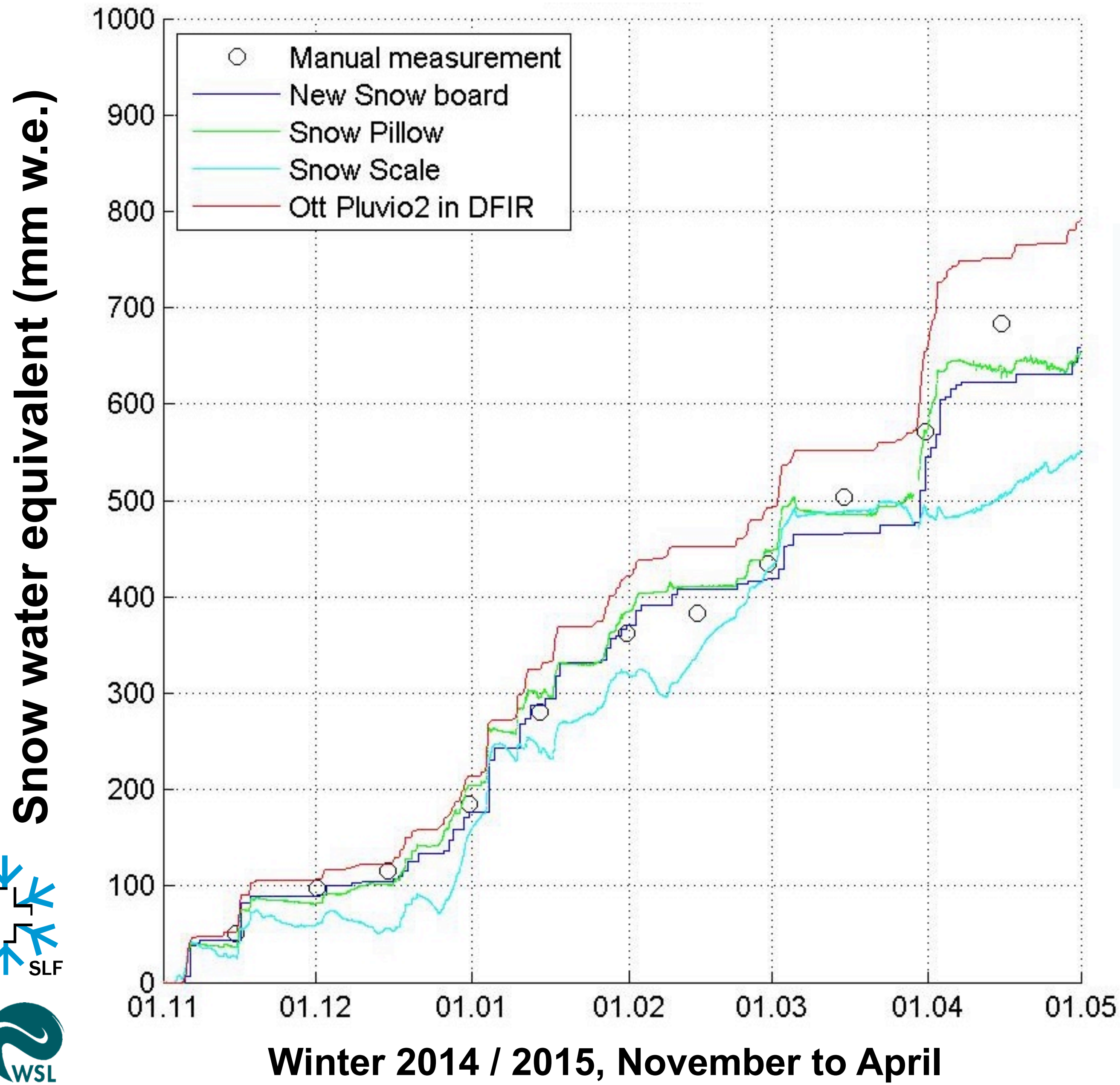
Catch ratio vs intensity (solid precip)



→ Catch ratio increases with intensity. The spread of catch ratio decreases with intensity.

Data: Nov-April 2014 & Nov-April 2015

Versus measurements of snow on the ground



→ What is the «true» SWE? Differences between various «truths» are much smaller than between the different gauges.