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Evapotranspiration of *Kobresia pygmaea* pastures under different stages of degradation

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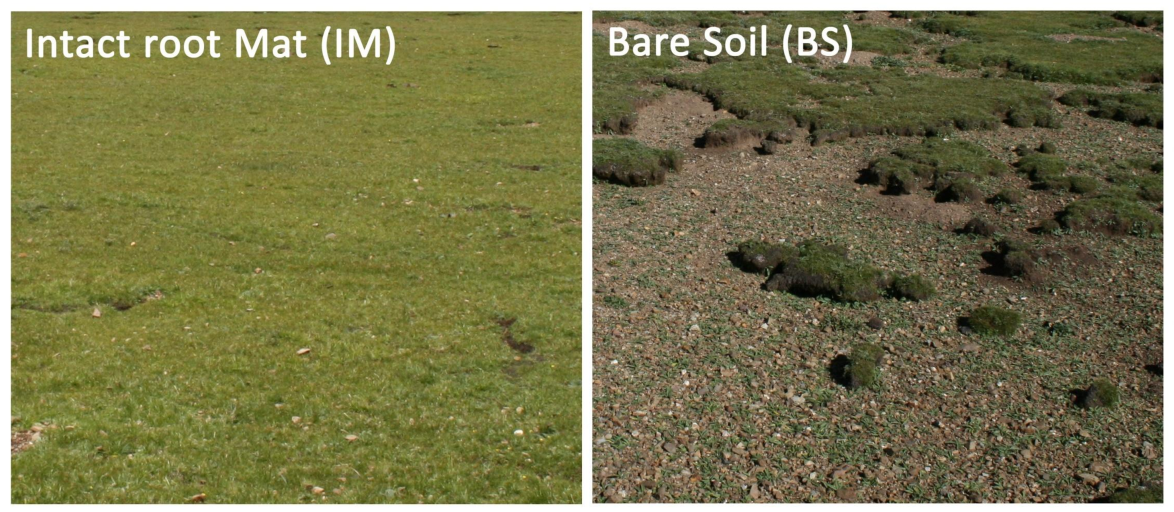
Introduction

Evapotranspiration (ET) plays an important role on the Tibetan Plateau. Especially during the monsoon season feedbacks of ET on precipitation is expected. The land cover is characterised by dense *Kobresia pygmaea* pastures and the alpine steppe with sparse vegetation and large fractions of bare soil. A stable turf layer, present beneath those *Kobresia* pastures confers special hydrological conditions dissimilar to bare soil or alpine steppe. This turf is likely subject to degradation due to effects of climate change, livestock management, pica damage and other possible influences.



Stadium at Kema site	Intact Root Mat	Bare Soil
short-name in Figure	IM	BS
dominant plant species	*Kobresia pygmaea*	Annuals e.g. *Axyris prostrata*
root mat layer	Yes	No
mean vegetation cover (%)	88 ± 6 (SD)	12 ± 8 (SD)
mean height difference (cm)	9.4 ± 2.0 (SD)	-

Fig. 1 Intact root mat and bare soil at Kema

Concept of the study

We investigated ET for *Kobresia pygmaea* pastures (IM) and for bare soil (BS), which is similar to alpine steppe (AS), for characteristics see Fig. 1

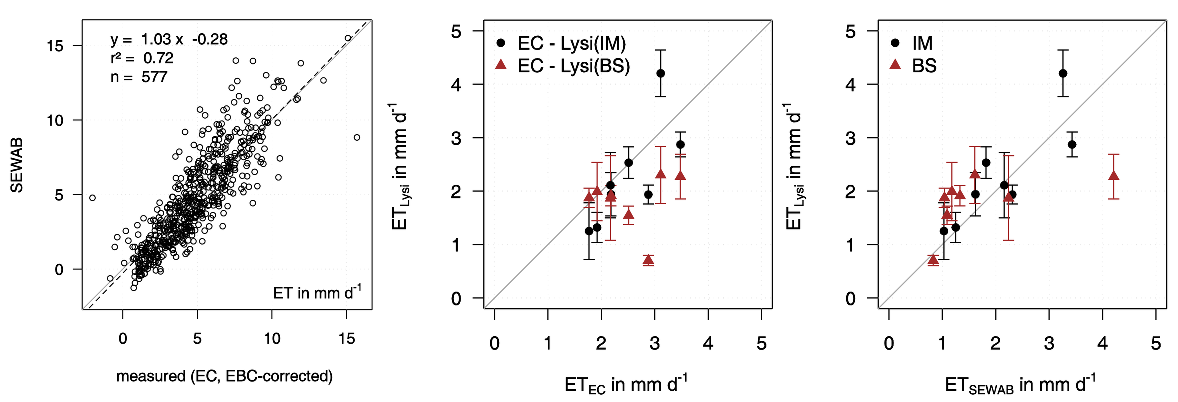


Fig. 2 Evaluation of lysimeter and SVAT model simulations with EC measurements at Kema 2010

Methods

- Eddy-covariance (EC) and Lysimeter measurements at Kema (Naqu district)
- SVAT modelling with SEWAB, adapted to the TP (Mengelkamp et al., 1999; Biermann et al., 2013)
- Convection modelling at Nam Co with ATHAM (Herzog et al., 2003, Gerken et al., 2013) using a ***dry*** and a ***wet*** scenario for both dense vegetation (***V75***: corresponds to IM) and sparse vegetation (***V25***: corresponds to BS, AS)

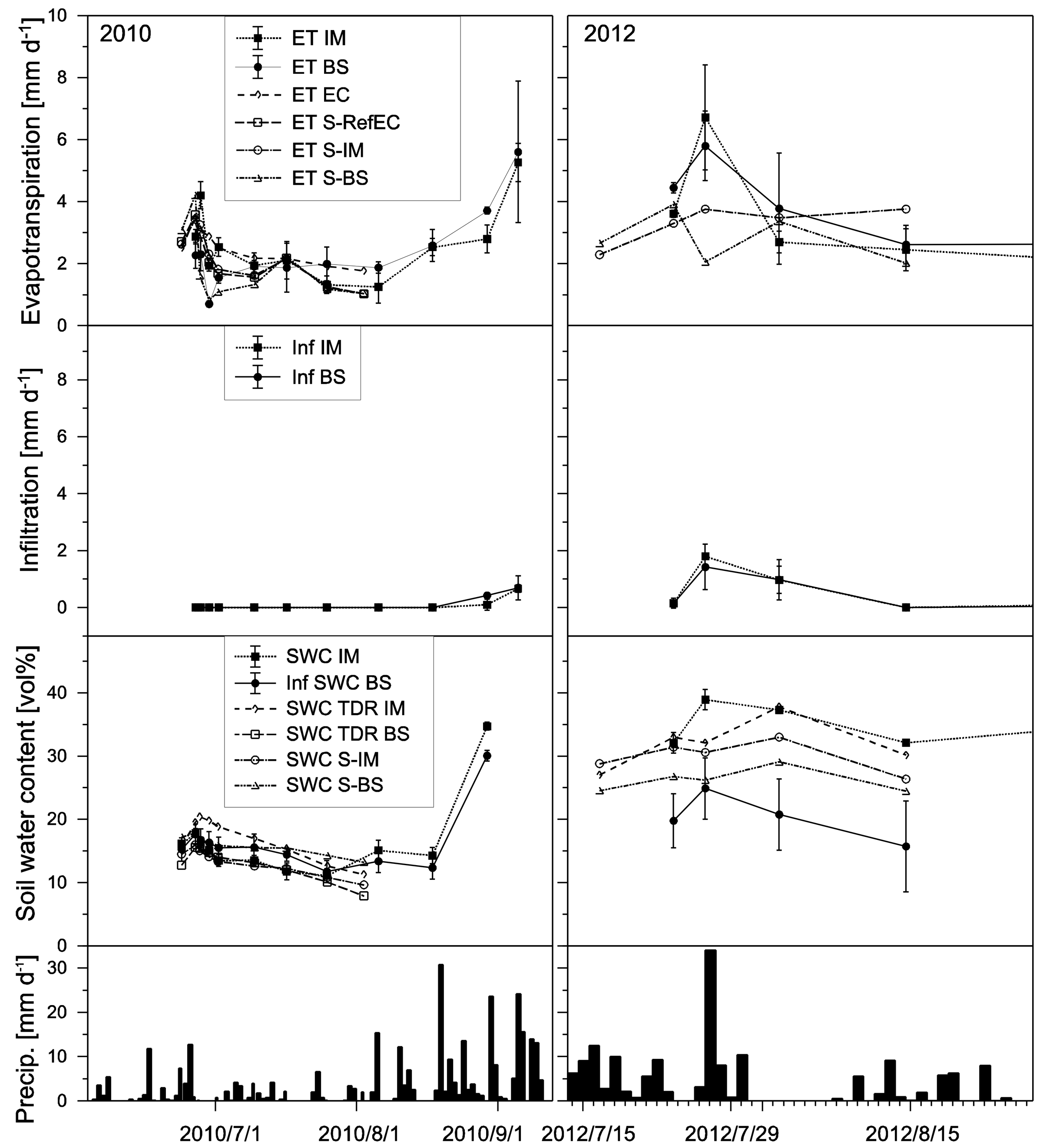


Fig. 3 Time series of ET, infiltration and soil water content at Kema, 2010 and 2012

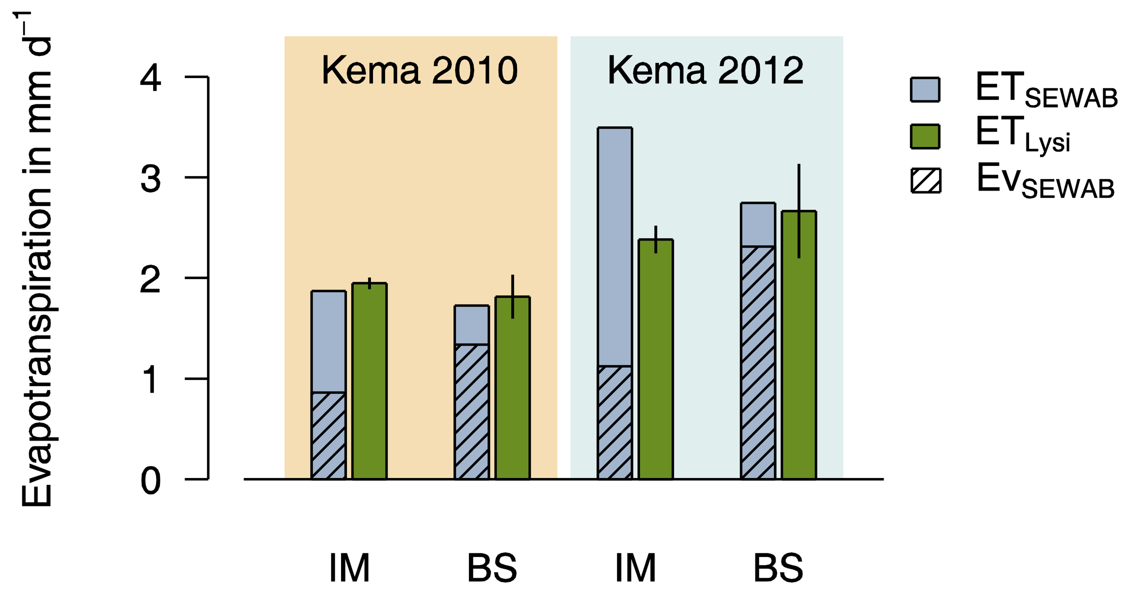


Fig. 4 Mean summer ET in Kema 2010 (June 23 - July 25) and 2012 (July 16 - Aug 24) ; hatched bar: evaporation only

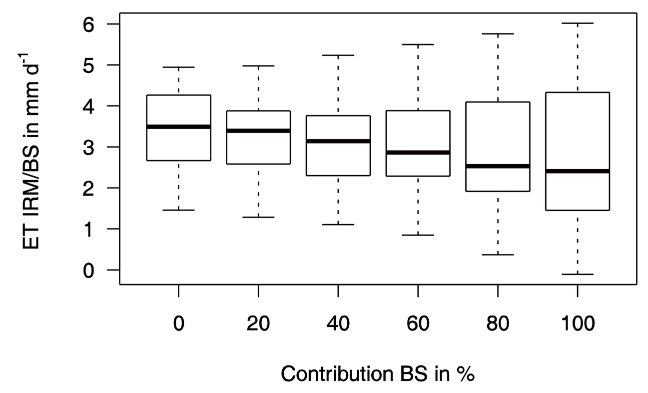


Fig. 5 Simulated mean daily ET for a transition from IM to BS with Kema 2012 forcing

Conclusions

- Large ET up to 6 mm d^{-1} above 4000m elevation possible
- Increased day-to-day variability of ET at BS, while magnitude does not change
- Earlier cloud development above alpine steppe (or BS), but less overall convection due to cloud shading in the early afternoon

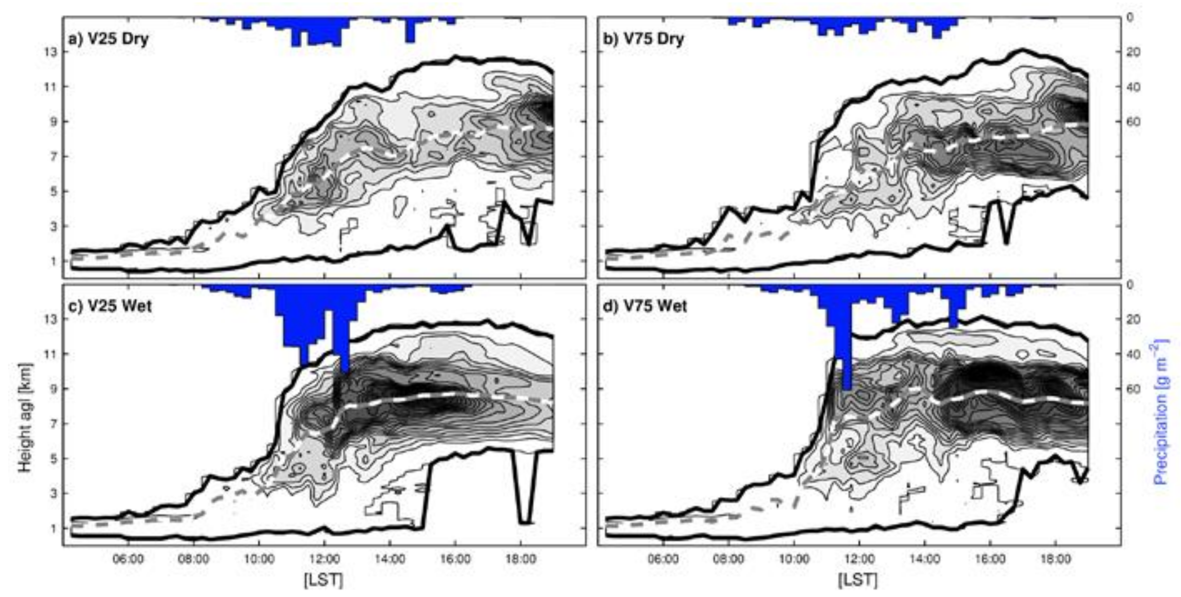


Fig. 6 Cloud and convection development at Nam Co with ATHAM

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Biermann, T., et al.: Turbulent flux observations and modelling over a shallow lake and a wet grassland in the Nam Co basin, Tibetan Plateau, Theor. Appl. Climat., 116, 301-316, 2014.
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