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Localization of ^{15}N uptake in a Tibetan alpine *Kobresia* pasture

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The *Kobresia* Pygmea ecotone covers approximately 450.000 km^2 and is of large global and regional importance due several socio-ecological aspects. For instance *Kobresia* pastures store high amounts of carbon, nitrogen and other nutrients, represent large grazing areas for herbivores, provide a fast regrowth after grazing events and protect against mechanical degradation and soil erosion. However, *Kobresia* pastures are assumed to be a grazing induced and are accompanied with distinct root mats varying in thickness between 5-30 cm. Yet, less is known about the morphology and the functions of this root mats, especially in the background of a progressing degradation due to changes of climate and management.

Thus we aimed to identify the importance of single soil layers for plant nutrition. Accordingly, nitrogen uptake from different soil depths and its remain in above-ground biomass (AGB), belowground biomass (BGB) and soil were determined by using a ^{15}N pulse labeling approach during the vegetation period in summer 2012. ^{15}N urea was injected into six different soil depths (0.5 cm, 2.5 cm, 7.5 cm, 12.5 cm, 17.5 cm, 22.5 cm / for each 4 replicates) and plots were sampled 45 days after the labeling. For soil and BGB samples were taken in strict sample intervals of 0-1 cm, 1-5 cm, 5-10 cm, 10-15 cm, 15-20 cm, 20-25 cm.

Results indicate that total recovery (including AGB, BGB and soil) was highest, if tracer was injected into the top 5 cm and subsequently decreased with decreasing injection depth. This is especially the case for the ^{15}N recovery of BGB, which is clearly attributed to the root density and strongly decreased with soil depth. In contrast, the root activity derived from the ^{15}N content of roots increased with soil depth, which is primary associated to a proportionate increase of living roots related to dead roots. However, most ^{15}N was captured in plant biomass (67.5-85.3 % of total recovery), indicating high ^{15}N uptake efficiency possibly due to N limitation of *Kobresia* ecosystems. Considering only the nitrogen uptake of AGB hardly any differences appeared between the six injection depths. Nevertheless, it could be shown, that 50.4 % percent of total variance of AGB nitrogen uptake could be explained by combining root density and root activity.

Concluding, from the upper root mat horizons highest amounts of nitrogen were taken up by plants, because root densities are correspondingly high. However, in deeper root mat layers the root activity increases and accordingly plays a key role for plant nitrogen supply in this depth. Underlying causes for increasing root activities may be better soil moisture conditions, lower variation of soil temperature and/or a higher access to plant available nitrogen in deeper soil layers.Please fill in your abstract text.