

University of Bayreuth



# Determination of Water Use and Its Regulation in the Temperate Deciduous Forests of South Korea

Eunyoung Jung, Dennis Otieno, Hyojung Kwon and John Tenhunen

Contact: Eun-Young.Jung@uni-bayreuth.de, Dennis.Otieno@uni-bayreuth.de



30

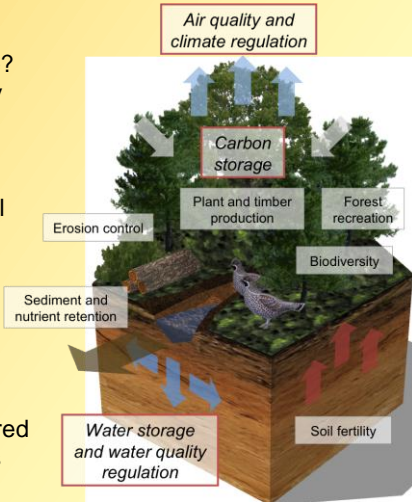
## Research Objectives:

To quantify water use by temperate deciduous forests in Korea  
To link forest water fluxes with estimated carbon fluxes  
To provide information to forest ecosystem service evaluations

Specific questions investigated are:

1. What factors limit or determine tree water use?
2. What controls understory transpiration?
3. How do the contributions of overstory and understory transpiration to total ET change over time?
4. How does forest water use and water use efficiency change along elevation gradients?

Fig. 1. Forest ecosystem services (ES). Italic letters in red frames are the major services quantified in this study.

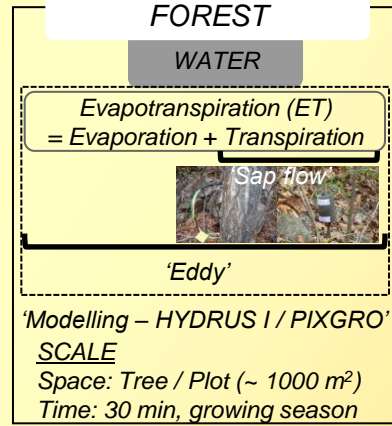


## Materials and Methods:



(Up) Fig.2. Study sites (a) Gwangneung, (b) 450 m, (c) 650 m, SE, (d) 650 m, SW, (e) 950 m in Haeon Catchment - all dominated by oak trees (*Quercus* spp.).

(Right) Fig.3. Flow of the research with methods and research scales



## Results and Discussions:

- Tree water use depends on stem diameter (Fig.3.).
- Understory transpiration is determined by canopy development via changing microclimate of the understory (Fig.4.).
- Contribution of the overstory and the understory transpiration to the total evapotranspiration is less during monsoon season (Table 1.).
- Forest water use and water use efficiency decreases with increasing elevation (Fig.5.).

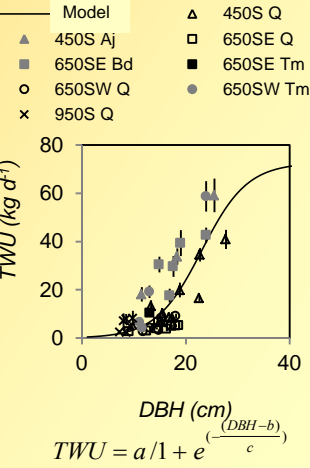


Fig.4. Relationship between DBH and tree water use (TWU)

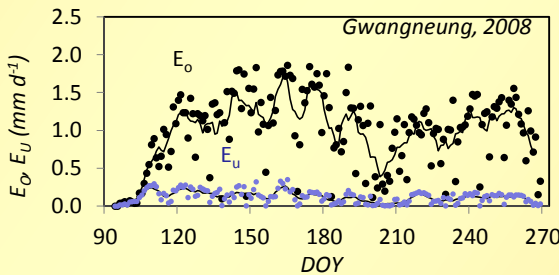


Fig.5. Transpiration of the overstory (E<sub>o</sub>) and the understory (E<sub>u</sub>)

Table 1. Monthly ratio of total transpiration (E<sub>o</sub> + E<sub>u</sub>) to evapotranspiration (E<sub>eco</sub>) in Gwangneung, 2008

	Apr	MAY	JUNE	JULY	AUG	SEPT
(E <sub>o</sub> +E <sub>u</sub> ) : E <sub>eco</sub>	0.89	0.80	0.68	0.58	0.42	0.74

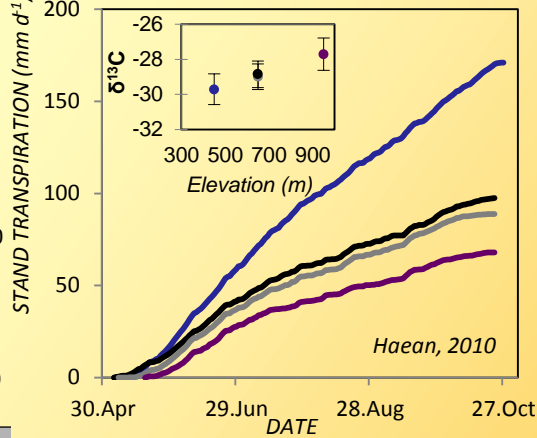


Fig.6. Stand transpiration and water use efficiency (δ<sup>13</sup>C) at different elevations in Haeon, 2010

## Linkage to Other TERRECO Research:

