

AN EMPIRICAL PARAMETERIZATION OF VERTICAL MIXING IN RAIN-GENERATED FRESH LENSES FOR USE IN THE RAIN IMPACT MODEL

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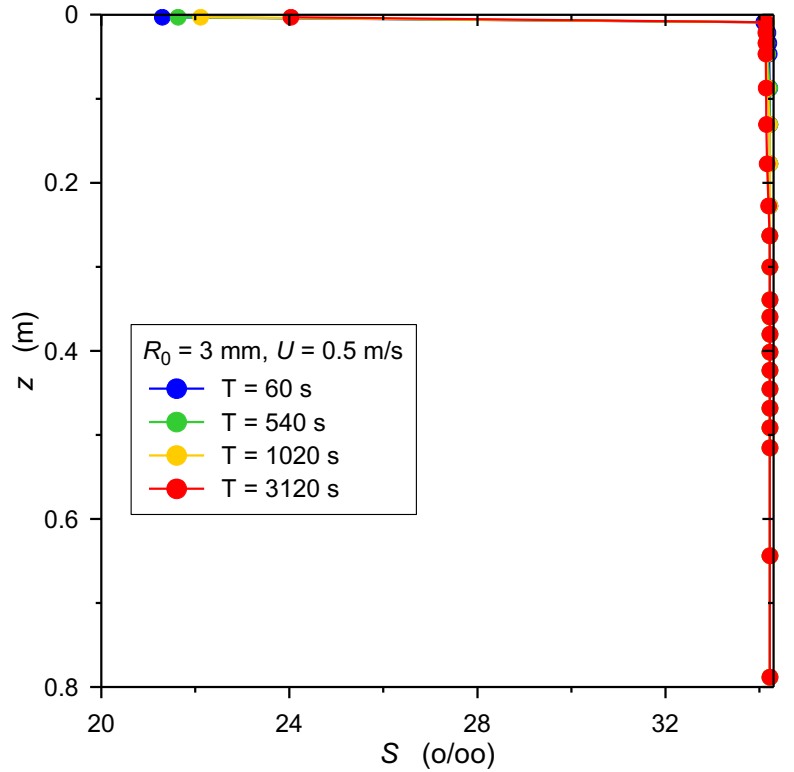
Rain Impact Model (RIM)

Goal is to add wind speed (and rain rate) dependence to K_Z

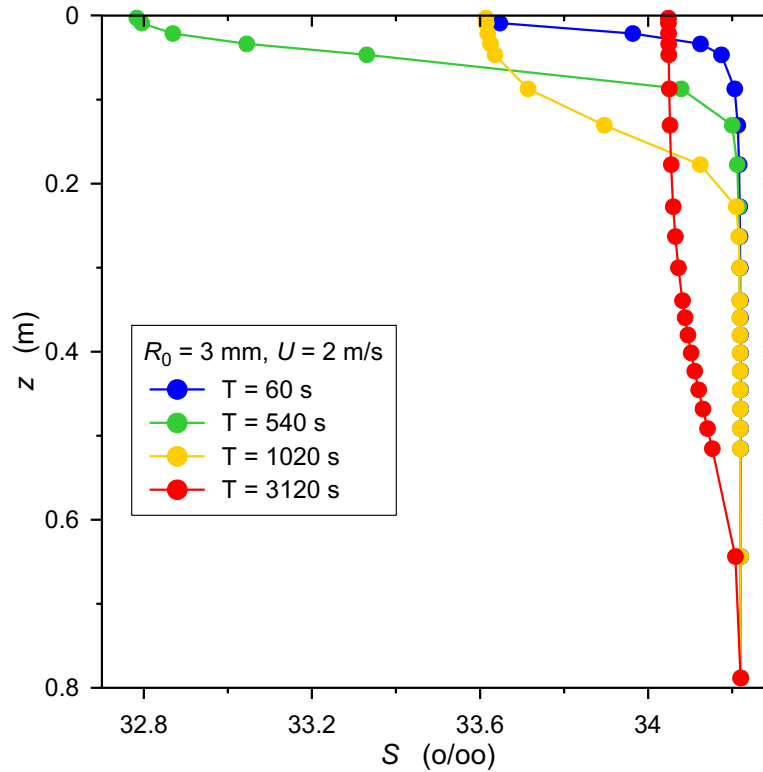
Use 1-D Simulations of Fresh Lenses to Calculate K_Z

- Generalized Ocean Turbulence Model (GOTM)
 - 2nd-order turbulence model
 - dynamic κ - ε TKE equation
- Rain modeled as delivered in a 1-minute pulse
- Constant wind speed (U)
- Vertical evolution of freshwater pulse tracked over 24-hours after rain ends
- Salinity calculated at 60-s time intervals
- Uppermost box for GOTM set at 0.007 m

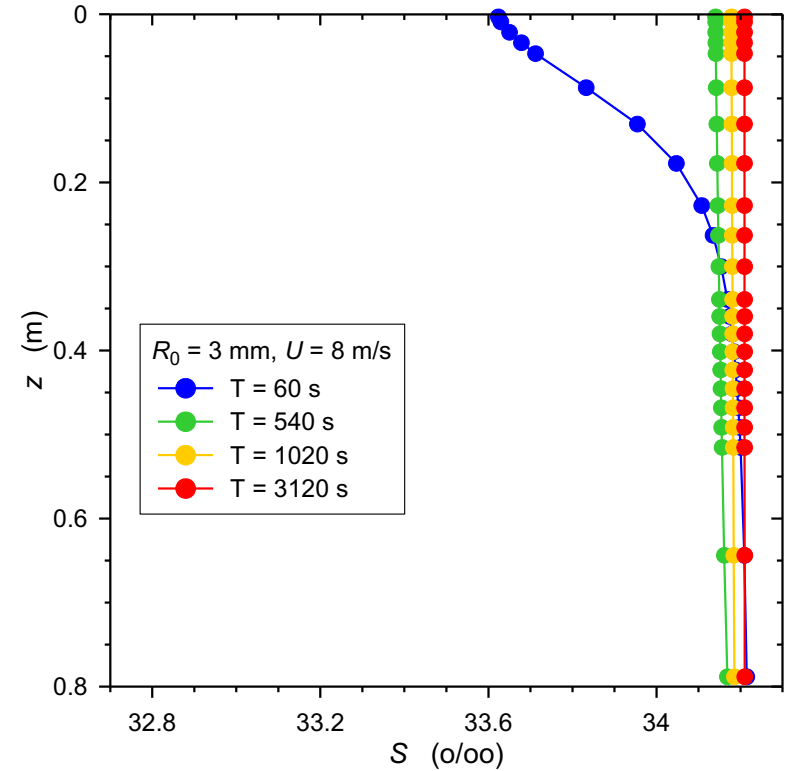
Examples of GOTM Salinity Profiles



$U = 0.5$ m/s



$U = 2.0$ m/s

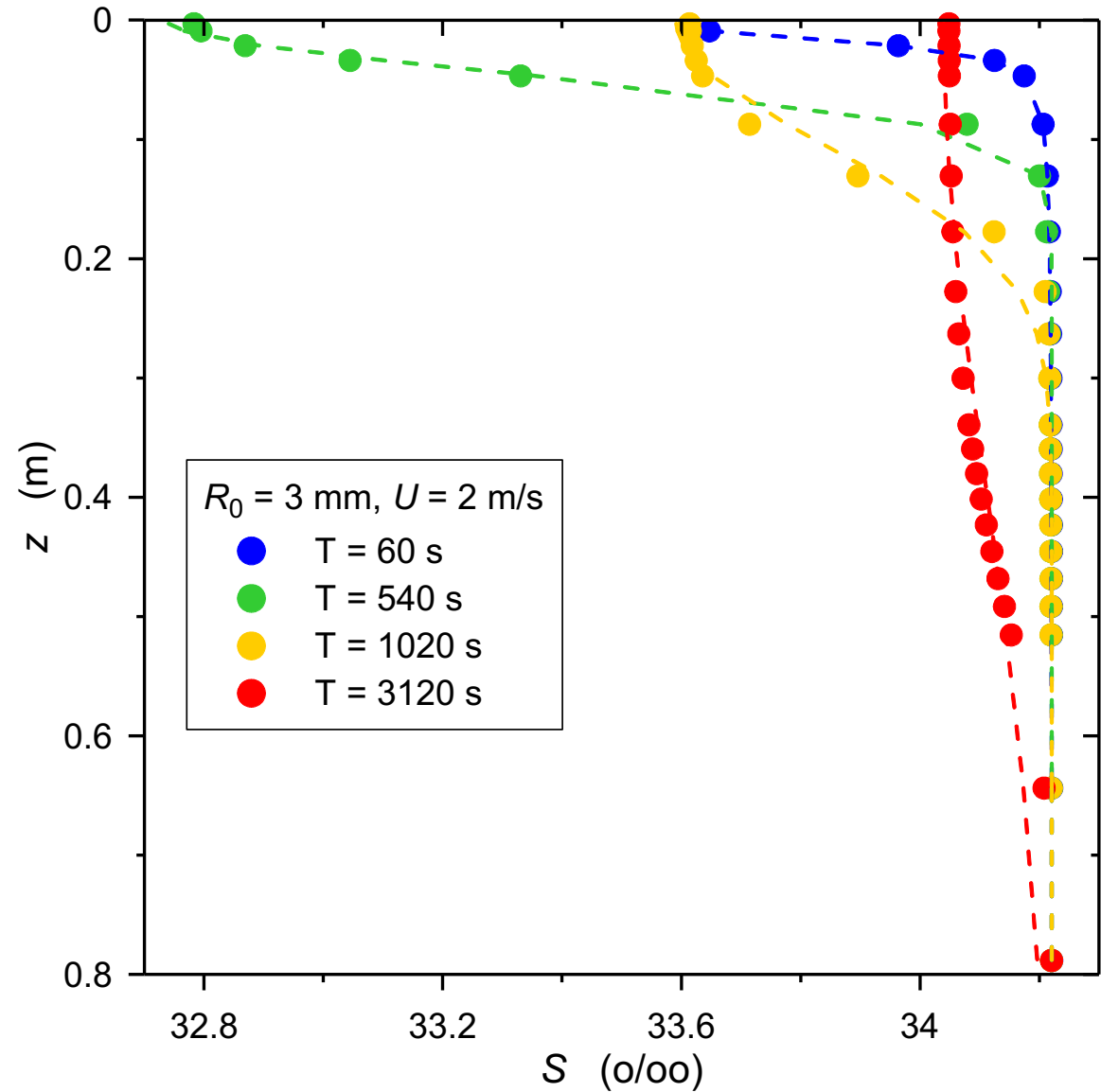


$U = 8.0$ m/s

Estimating K_Z From GOTM Numerical Data

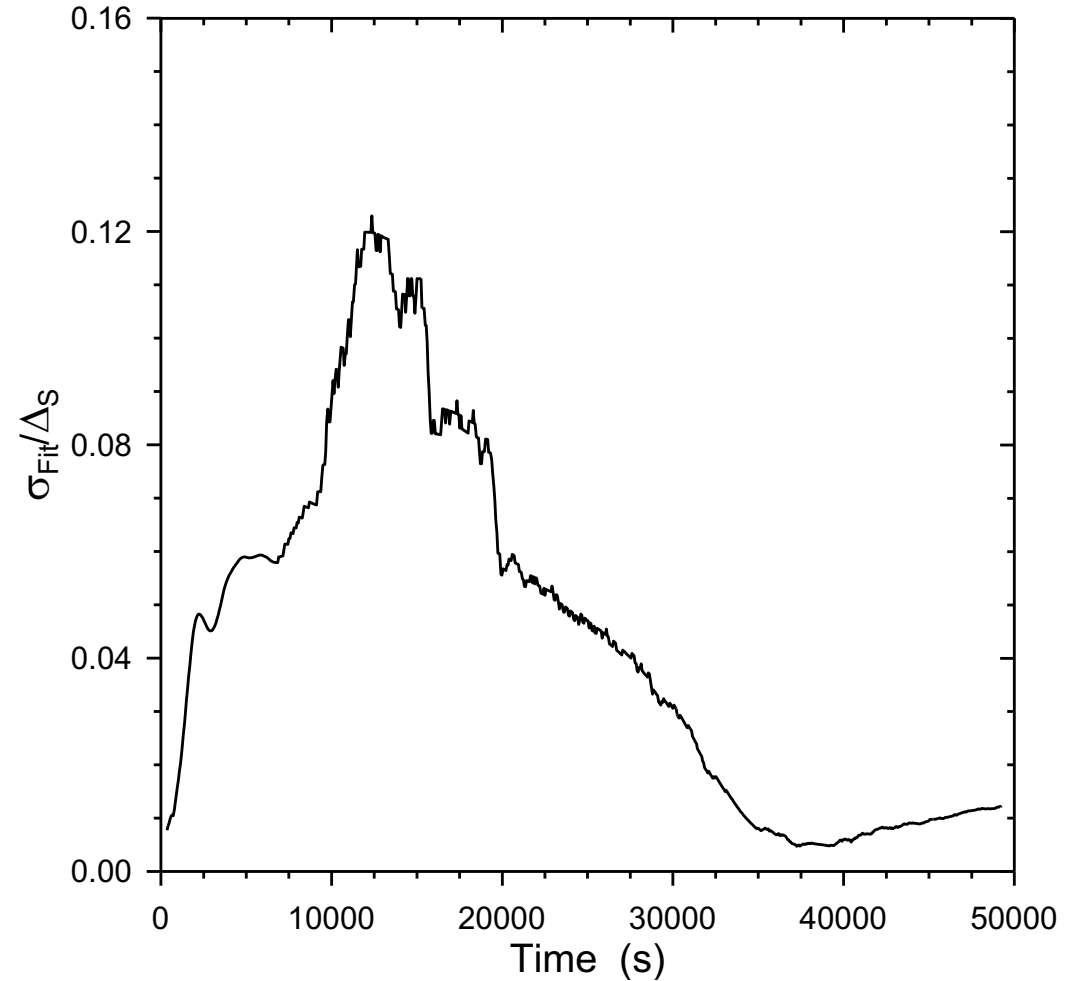
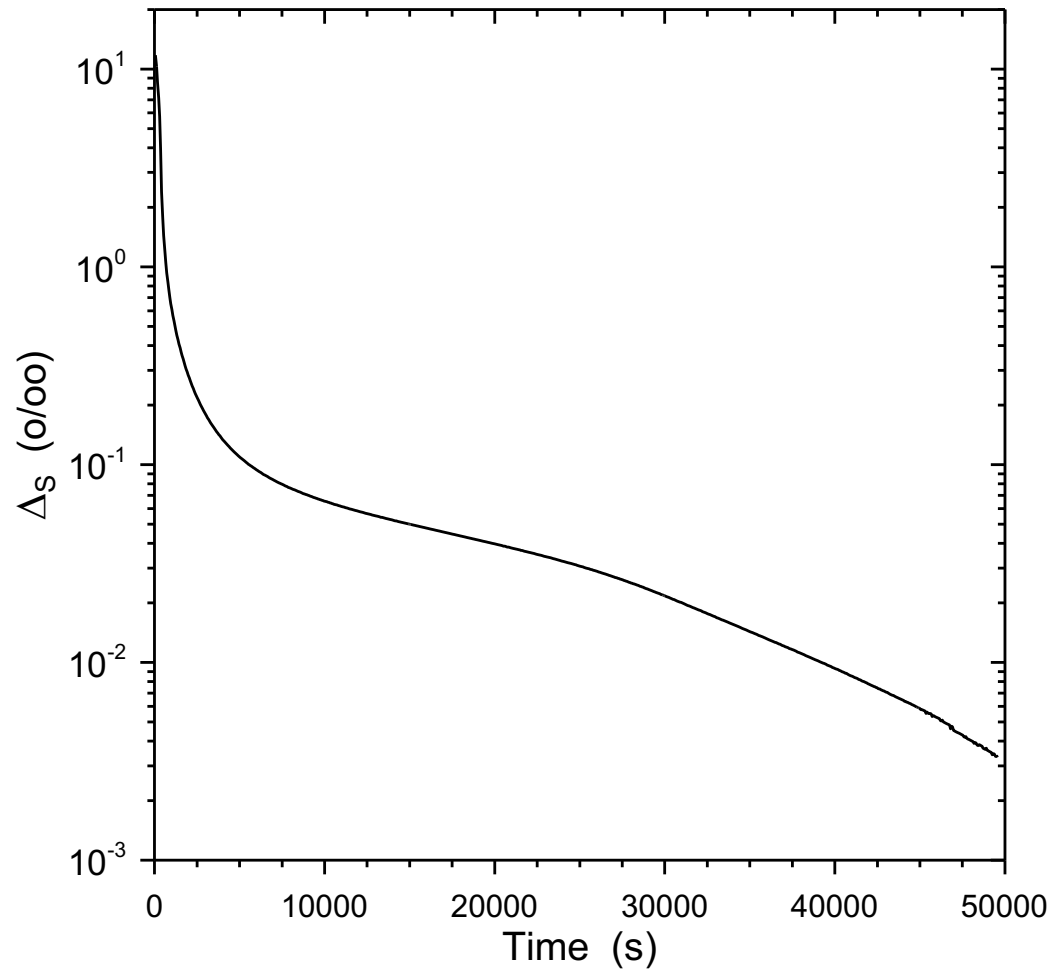
Fit 1-d model:

to GOTM salinity profiles at each time step using d_0 and K_Z as fitting parameters

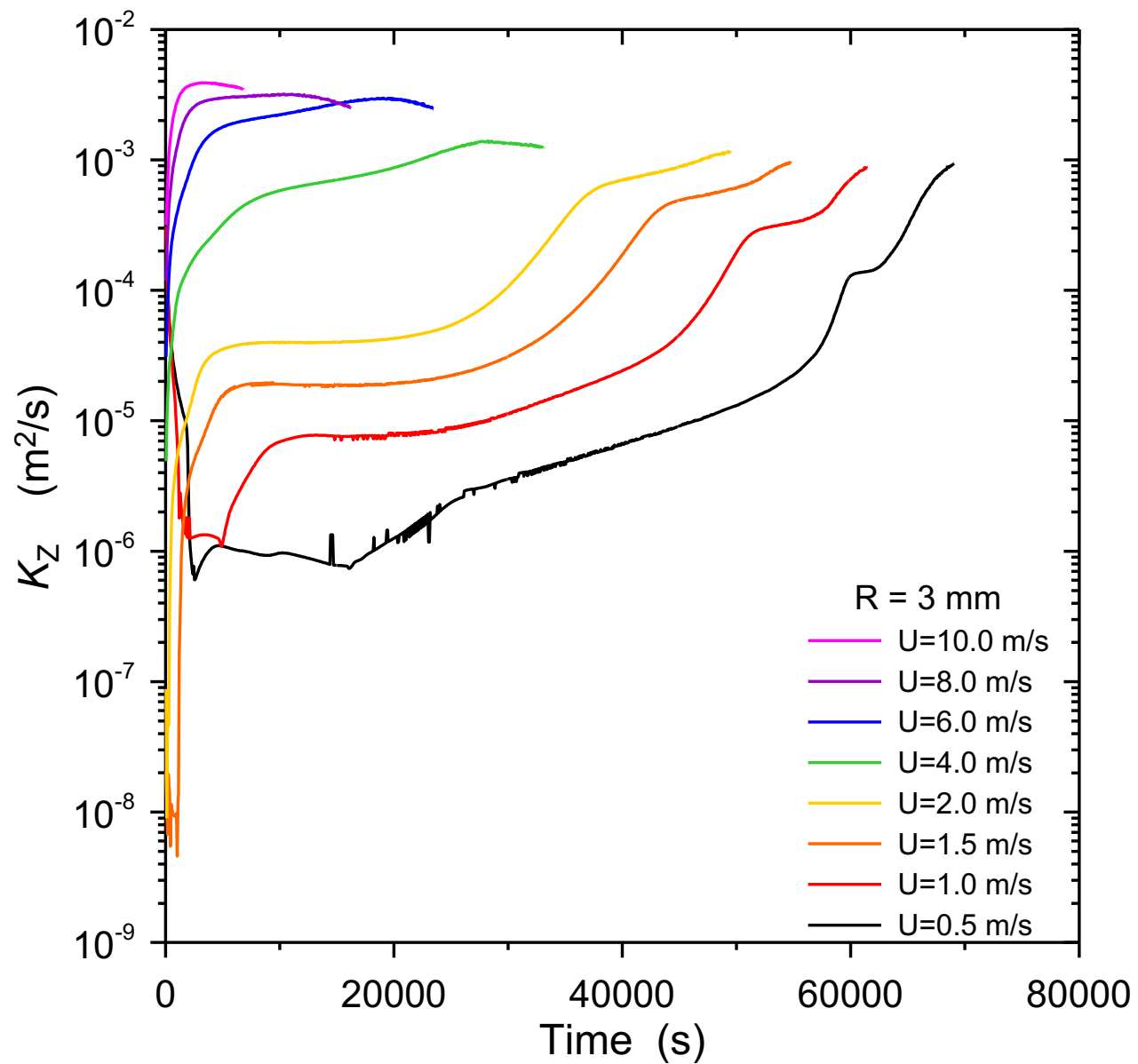


Typical GOTM K_Z Fitting Results

$U = 2$ m/s $R = 3$ mm

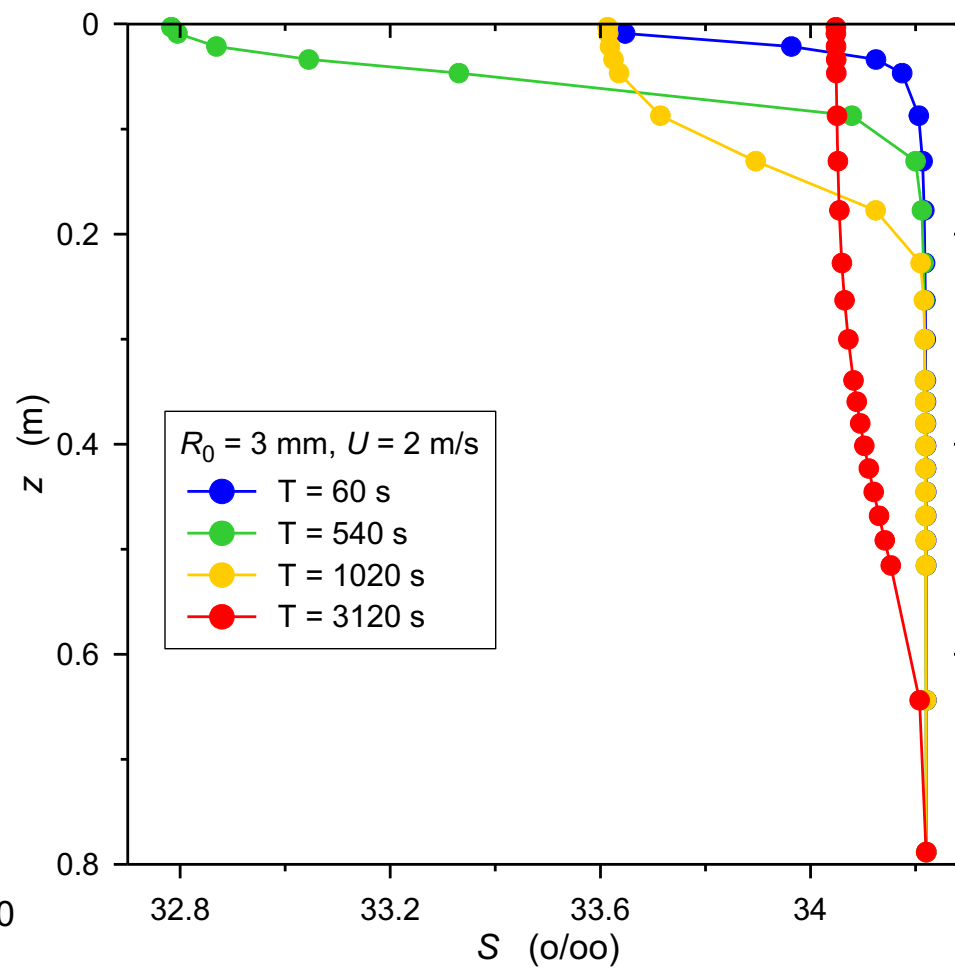
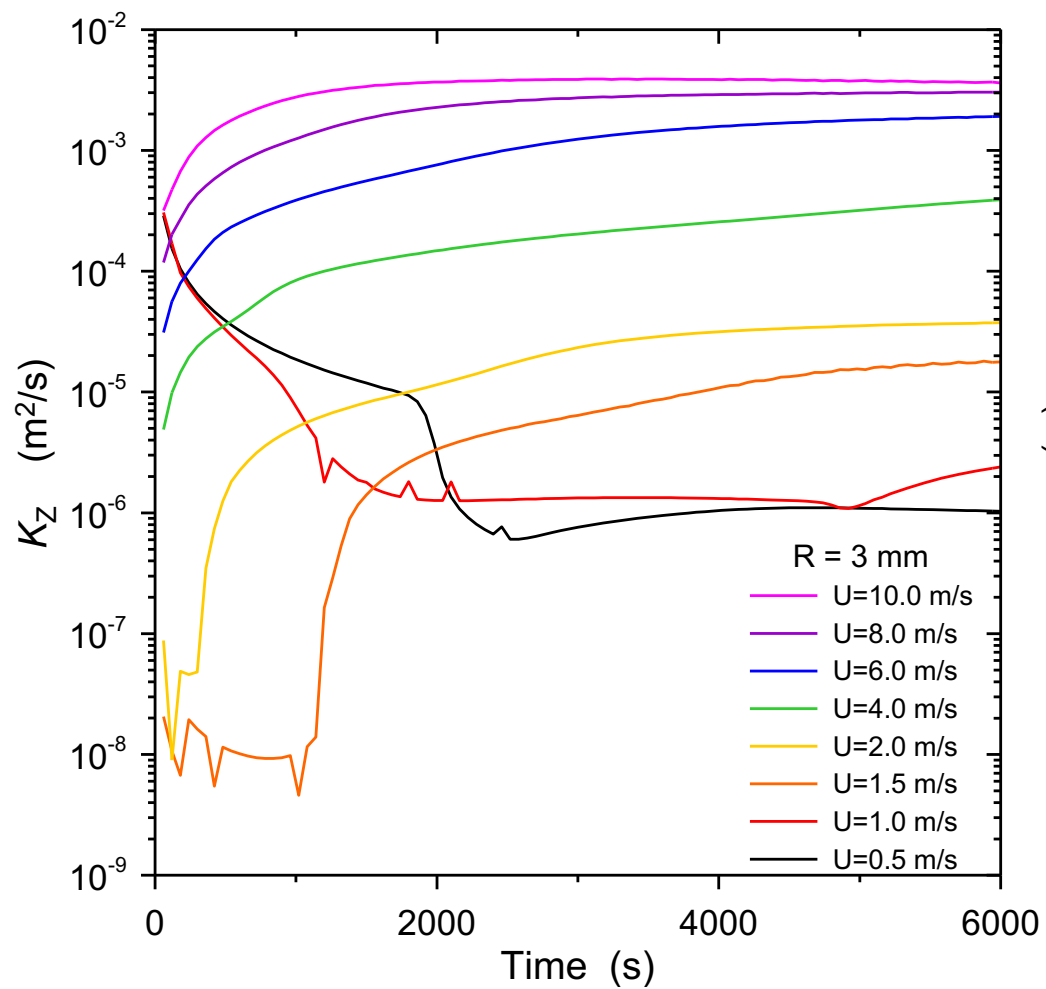


Time Series of K_Z as a Function of U

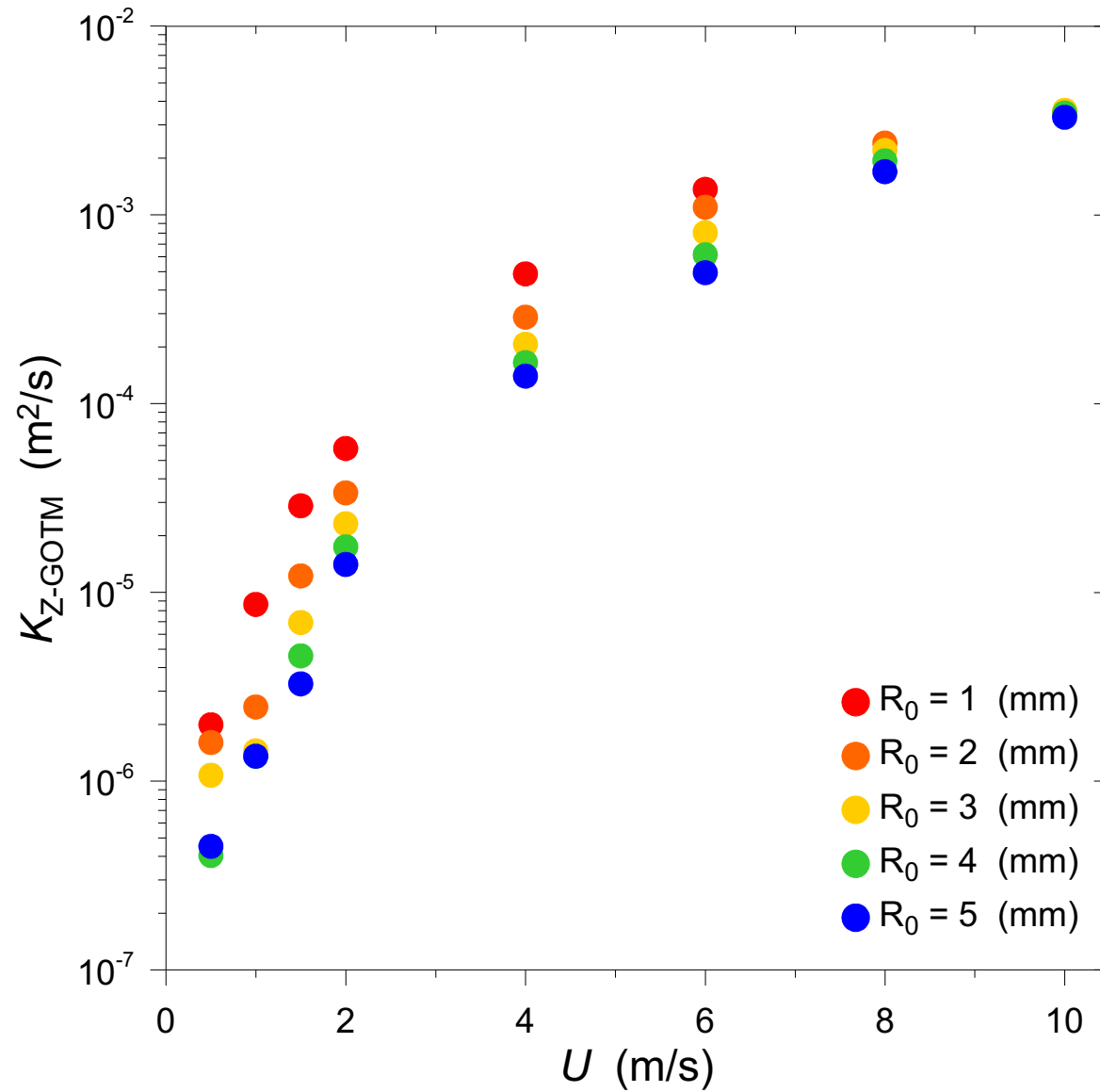


Time Series of K_Z as a Function of U

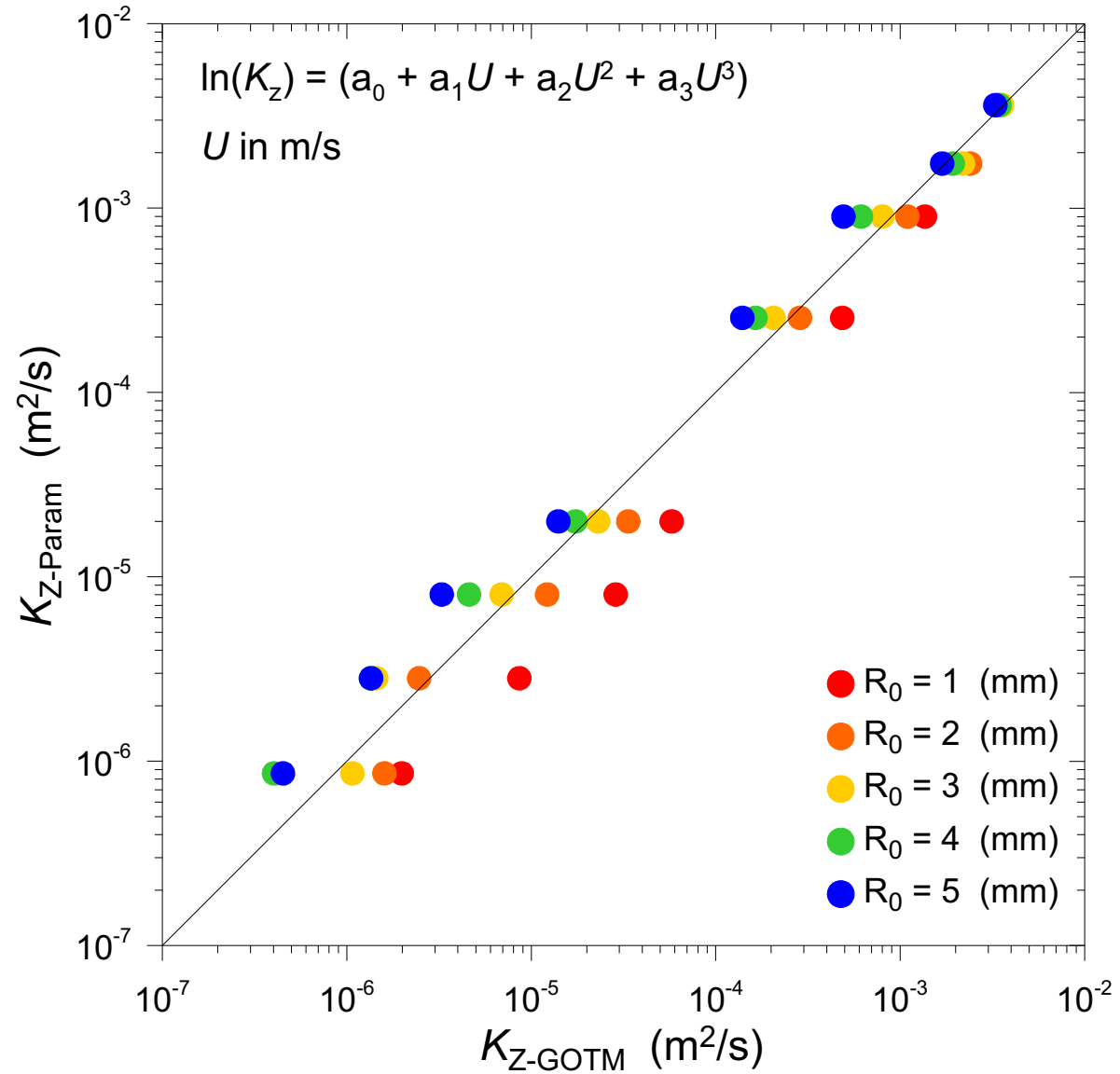
Details



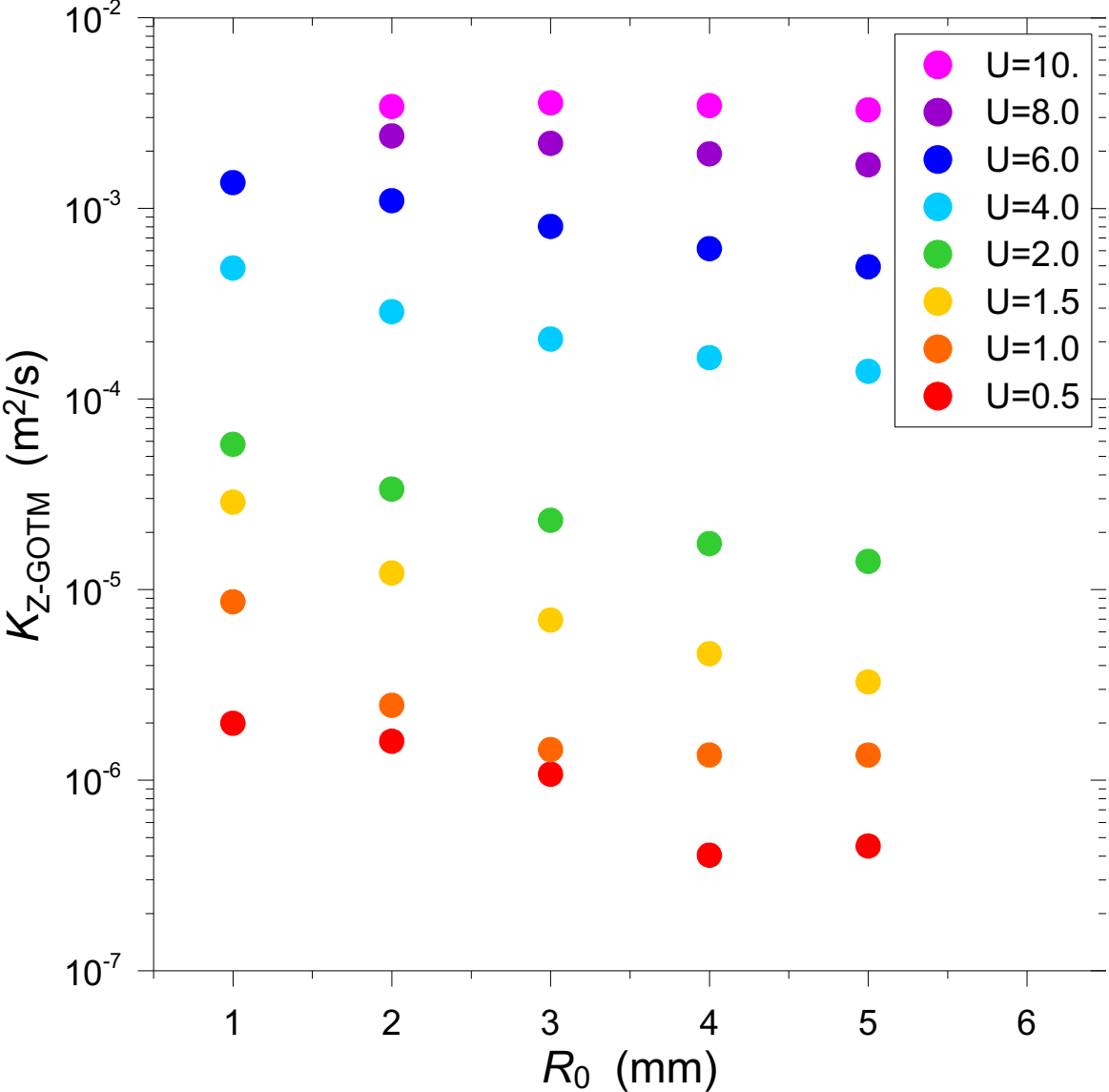
GOTM-Derived K_Z as a Function of U



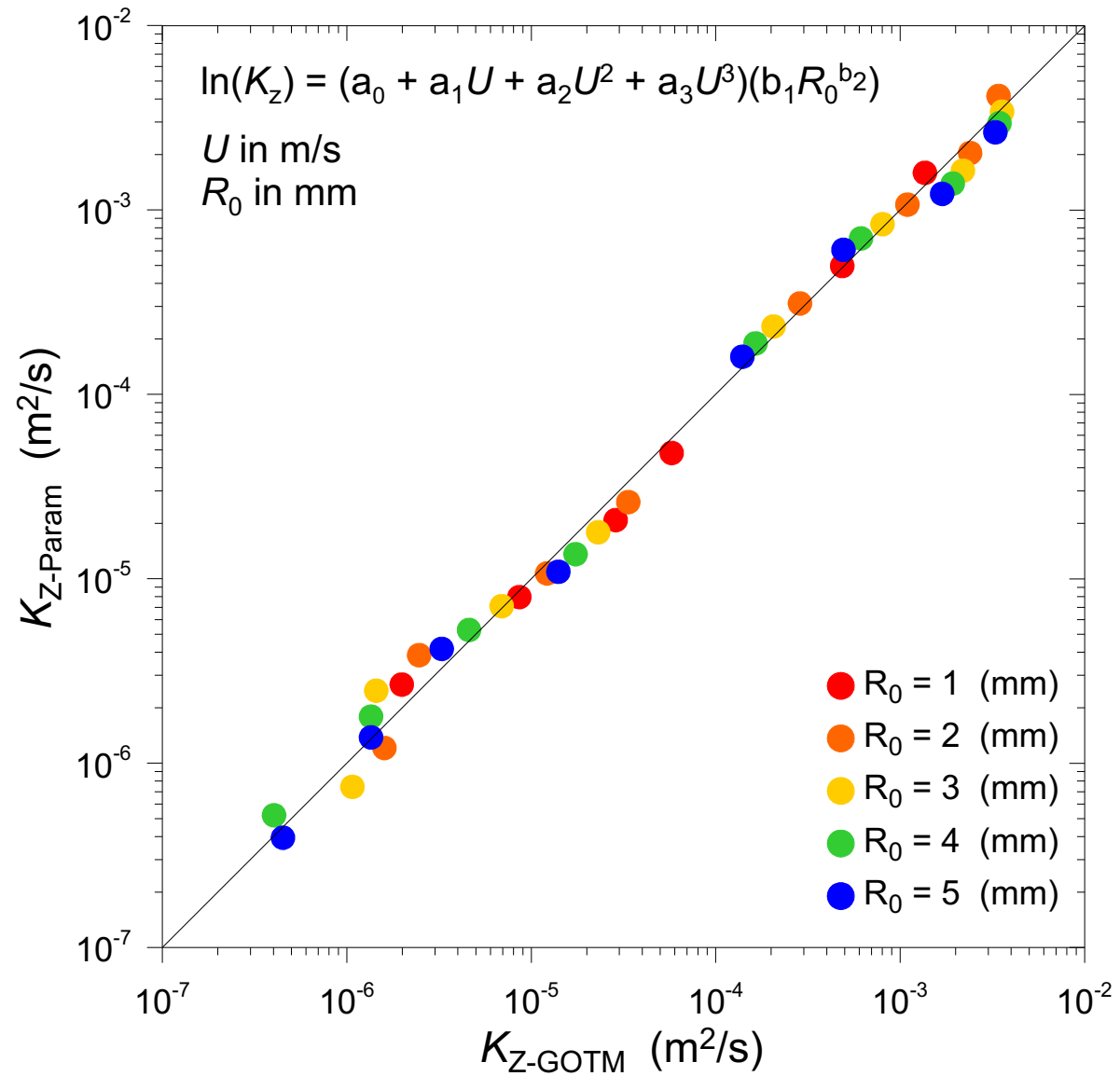
Parameterization of K_Z Including U



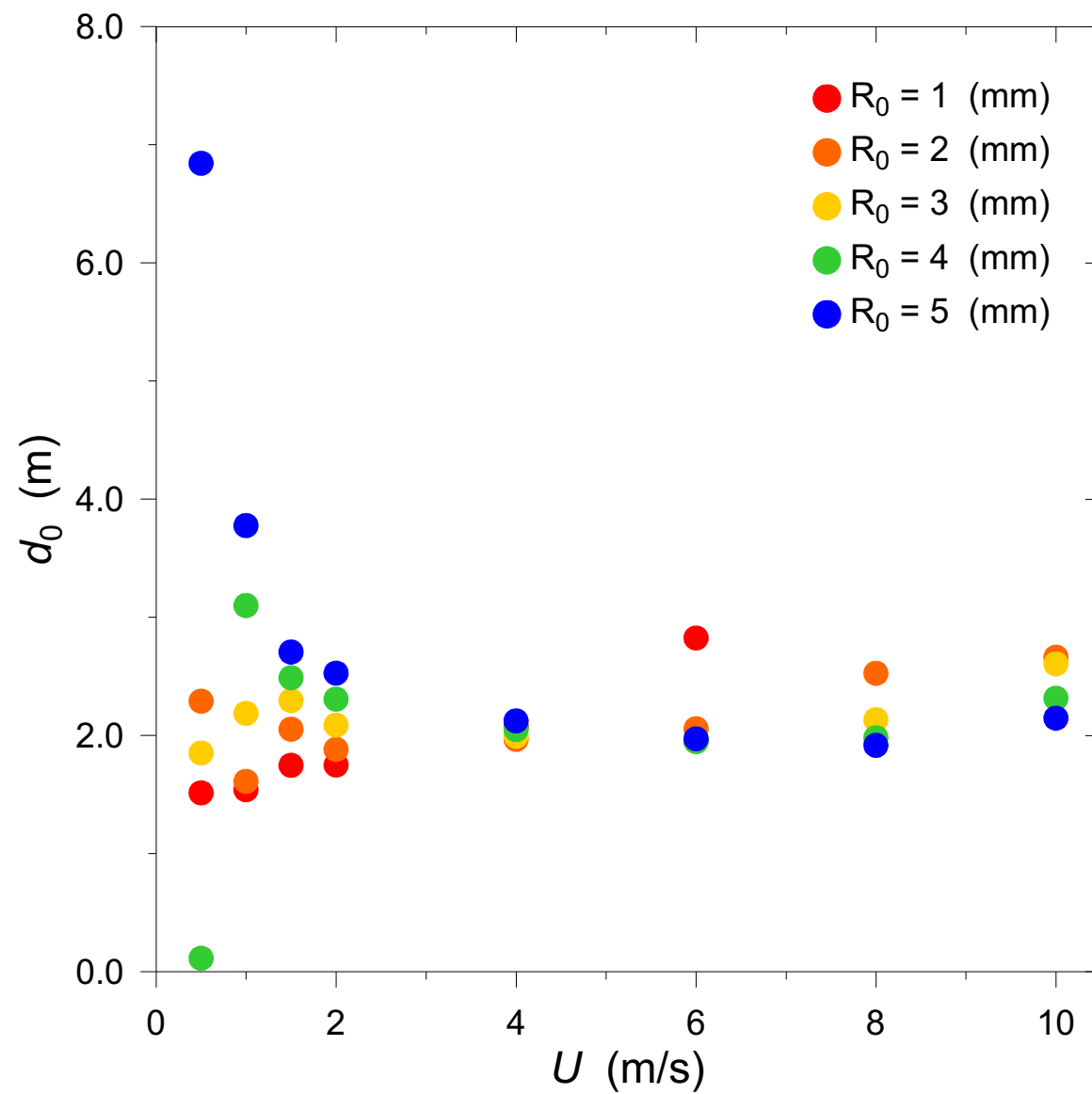
Effect of R on K_Z



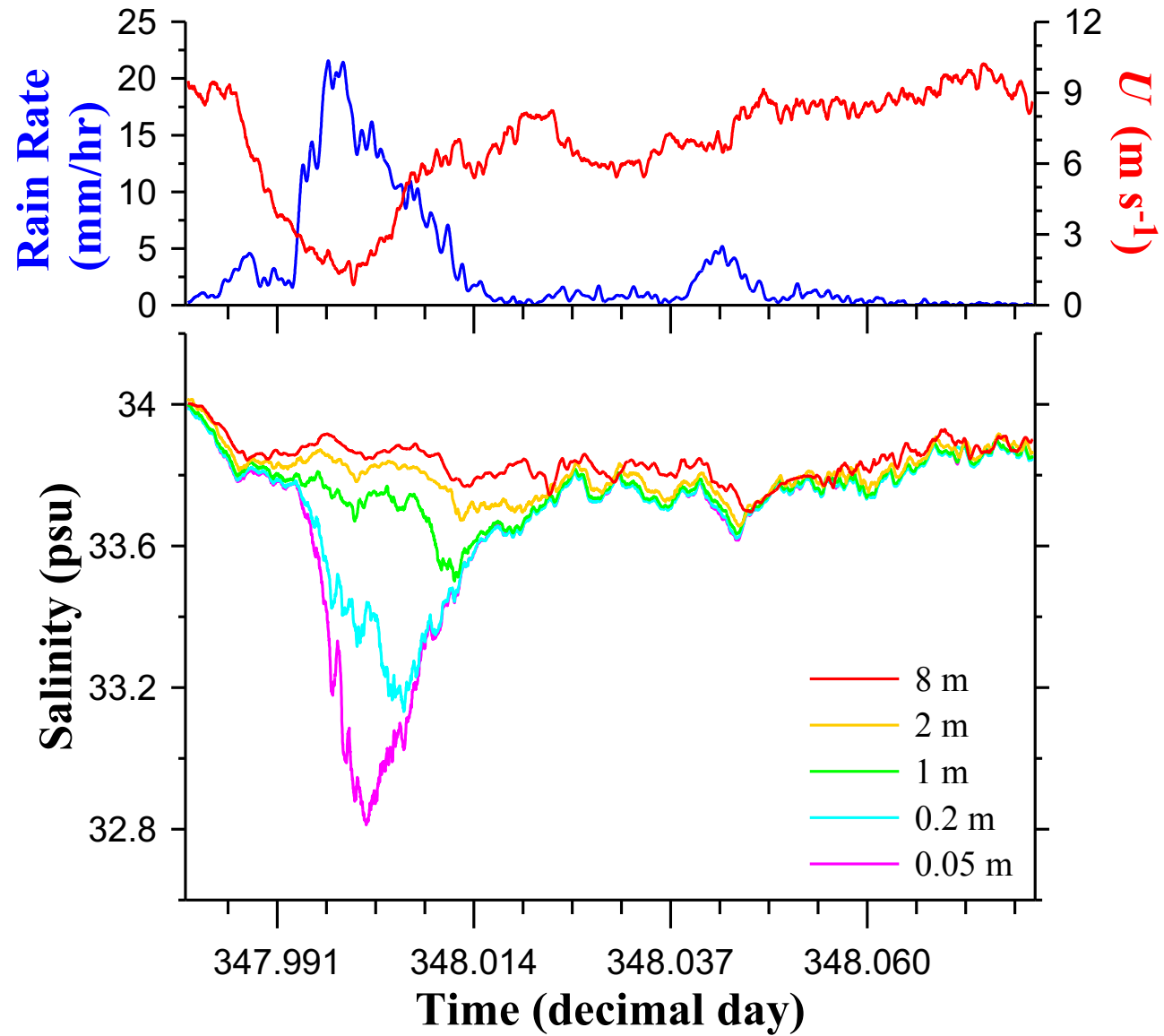
Parameterization of K_Z Including U and R



Results for Fitting d_0



Issues in Using GOTM With Constant U , Boxcar Rain



Conclusions

- Because K_Z appears to be a function of stratification, K_Z is not constant over lifetime of fresh lens even at constant wind speed
- However, by averaging over time, it is possible to develop parameterizations of K_Z in terms of U and R
- It is unclear at this point how to deal with more realistic distributions of rain and wind in terms of developing parameterizations of K_Z
- At wind speeds above ≈ 7 m/s, detailed information about the behavior of K_Z is largely irrelevant for RIM since fresh lenses have short lifetimes