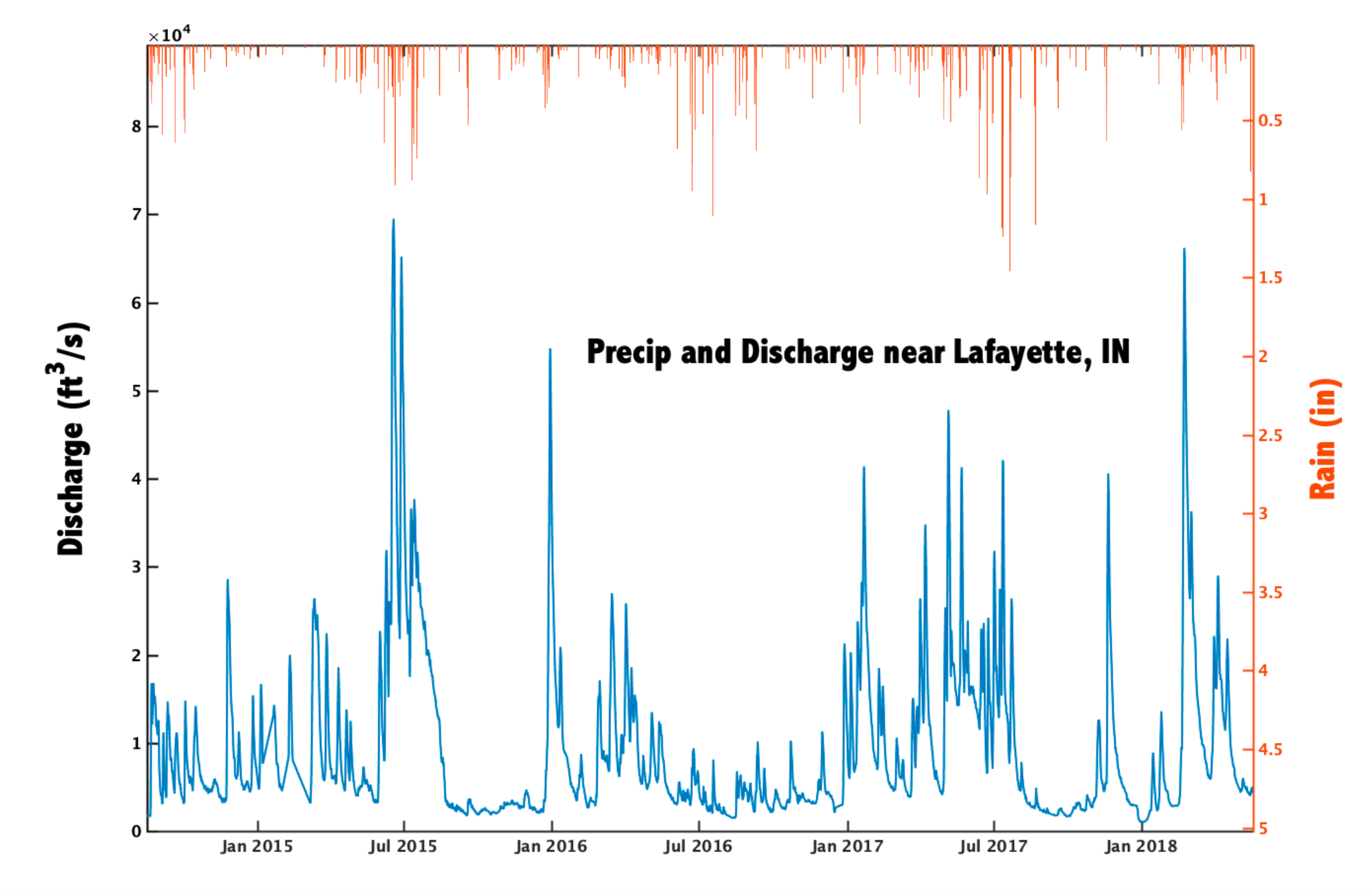
Groundwater Cycle

Seasonal Recession Method

Groundwater Cycle Course

PURDUE UNIVERSITY | Lyles School of Civil Engineering

Recession Method



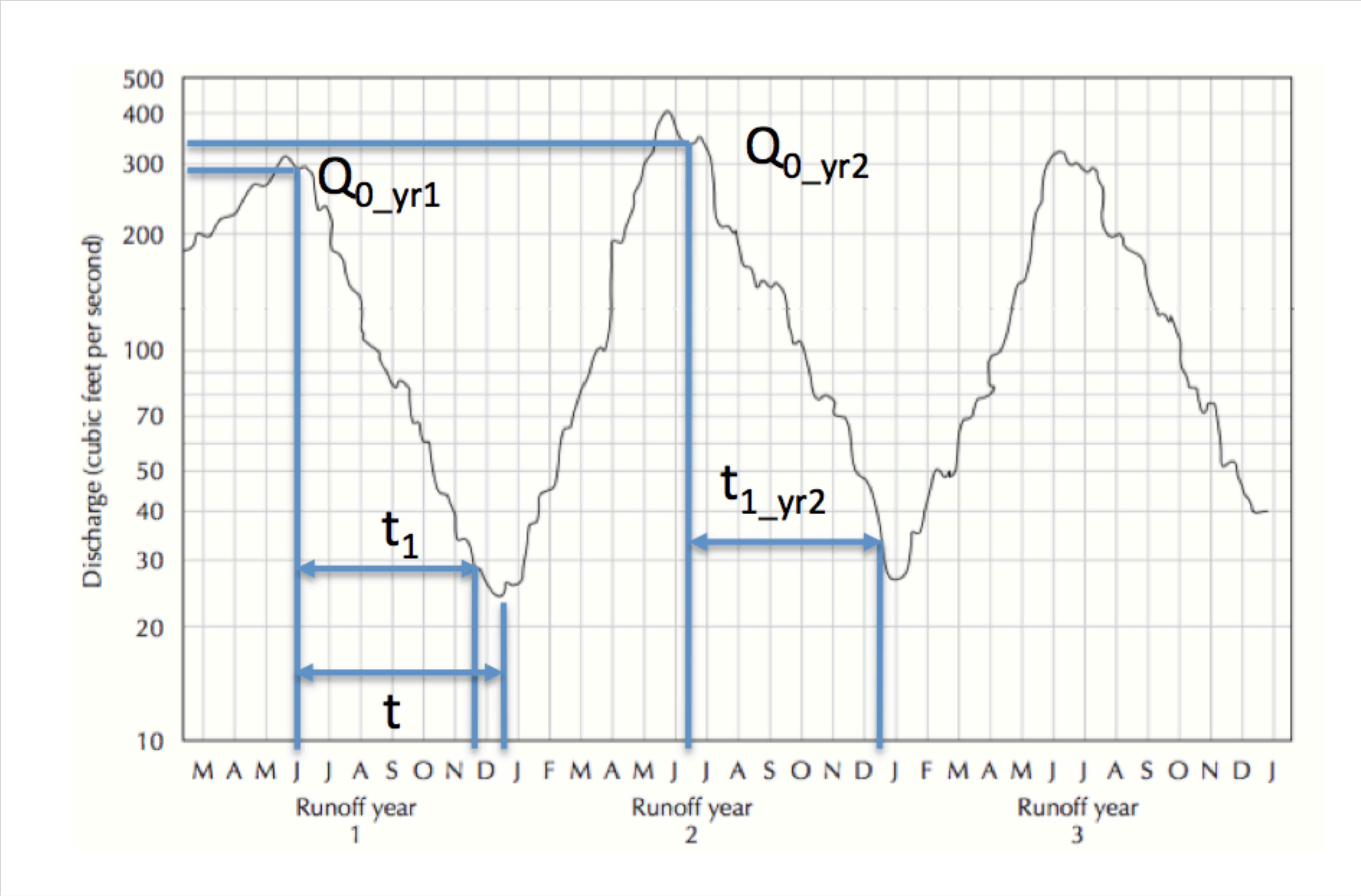
Recession Method

Assumptions:
- No dams
- No snow
- Long recession

Similar to single event:
- Vtp
- t_1

Different from single event:
- t: length of actual recession
- Vt: Amount of potential discharge left at the end of the season (at time t). This can be negative if the recession time is less than t_1!

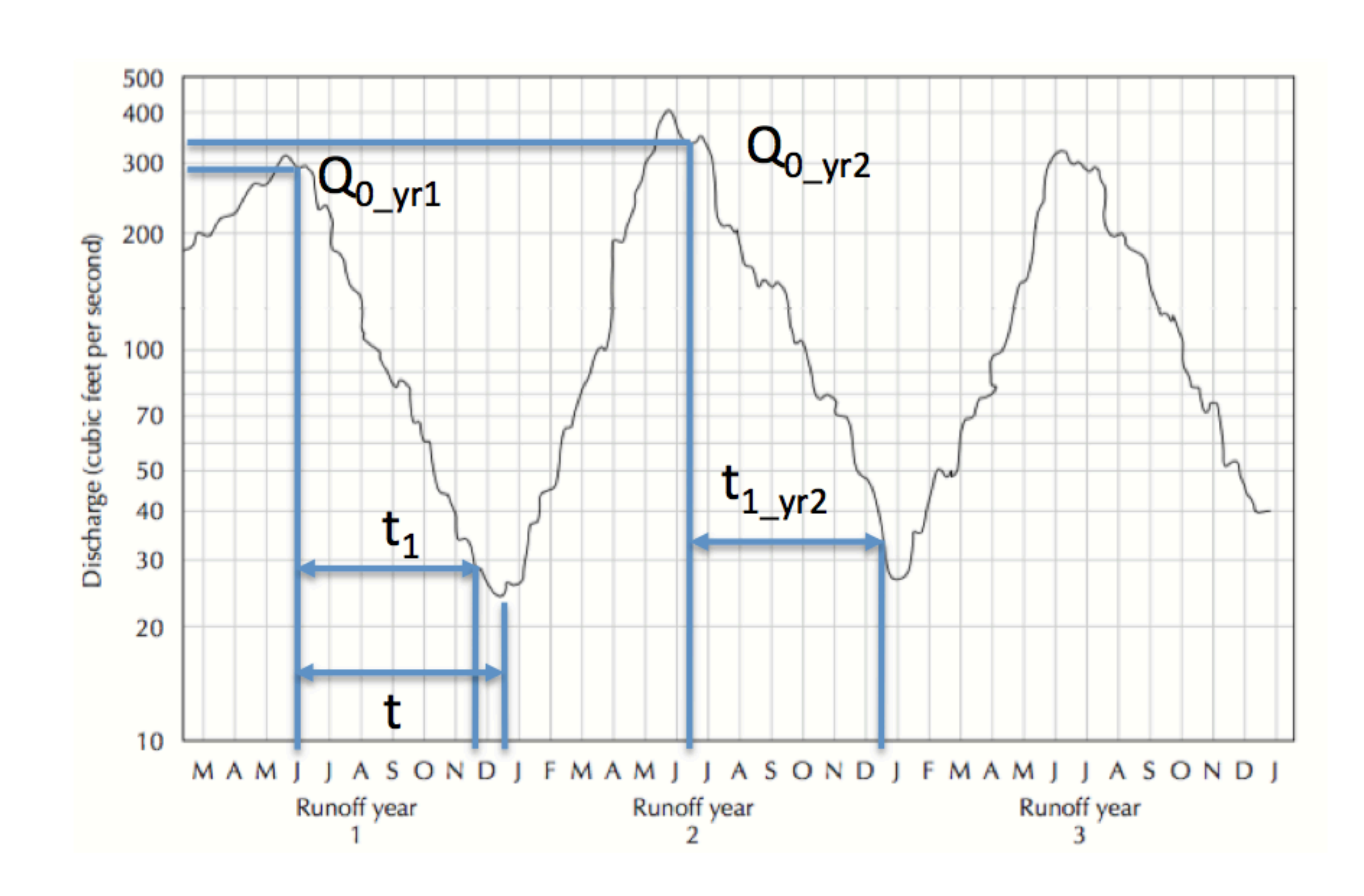
  The difference between actual discharge and potential discharge gives the change in storage from the water balance equation.



Recession Method

1) Find peak year 1 and year 2
2) find t1 yr 2 and 2 (time to 0.1 Q)
3) calculate Vtp yr 1 and 2
4) find t for yr1
5) Calculate $V_t = \dfrac{V_{tp,yr1}}{10^{t/t_1}}$
6) Calculate recharge using:

$R = V_{tp,yr2} - V_{t,yr1}$



Recession Method

Your answers could vary depending on how you chose the variables…

VtpYr1=300*5.5*30*24*3600/2.3

%Vtp_Year1 = 1.8595e+09

VtpYr2=320*6*30*24*3600/2.3

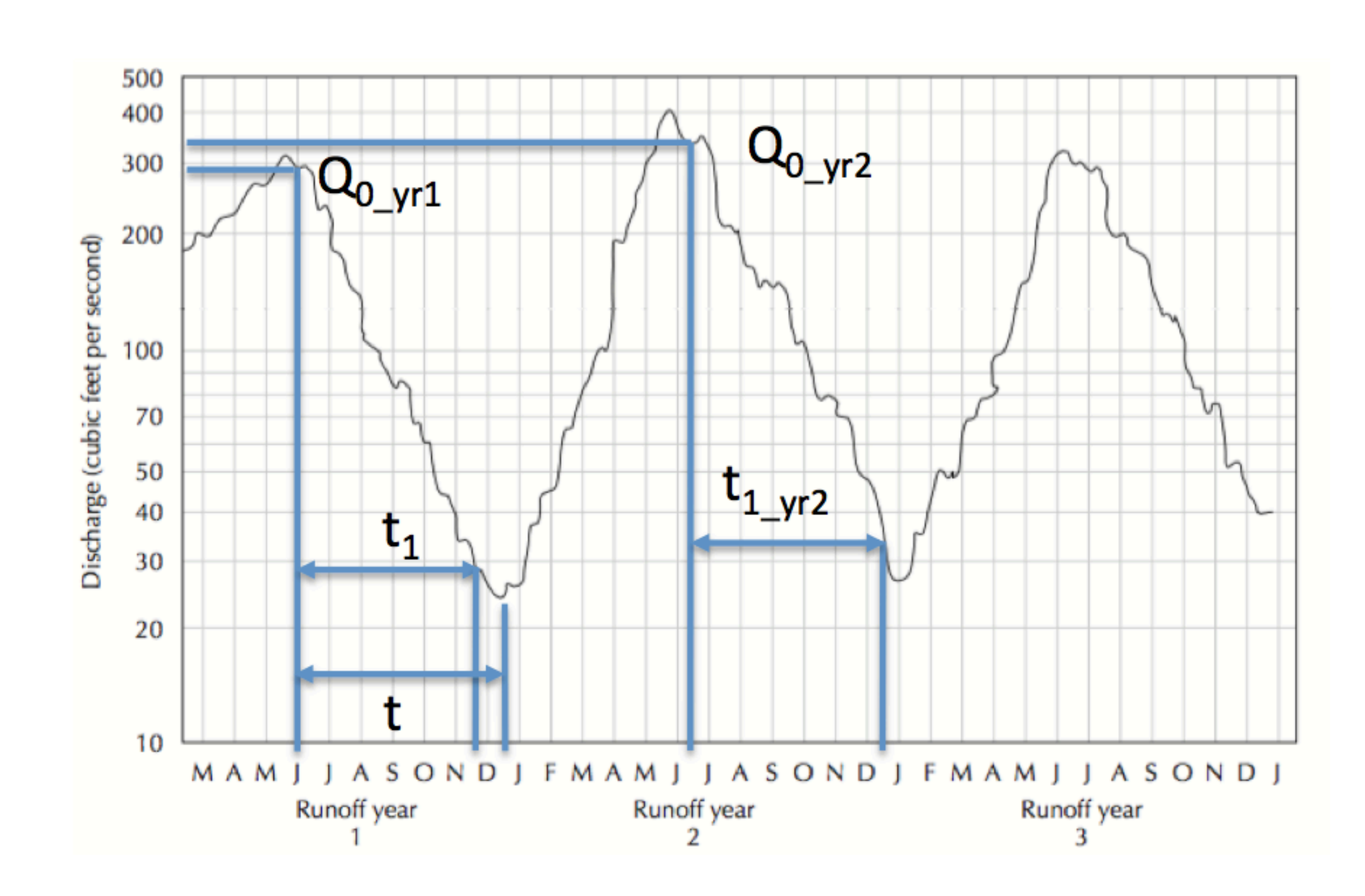
%Vtp_Year2 = 2.1638e+09

VtYr1=VtpYr1/(10^(6.5/5.5))

%Vt_Year1 = 1.2234e+08

Recharge=VtpYr2-VtYr1

%Recharge = 2.0414e+09 cubic feet



Recession Method

Exercice:

Redo the calculations if you choose the peak flow in year 2 in mid May at $400 ft^3$ and the end of the recession at the beginning of January. What is the relative error in percent?

If this data is for the entire Mississippi basin (1.15million sq miles), and assuming 1m annual rainfall over the basin, what is the percent of the rain that recharges the aquifer?

Recession Method

Recharge = 2.0414e+09 cubic feet

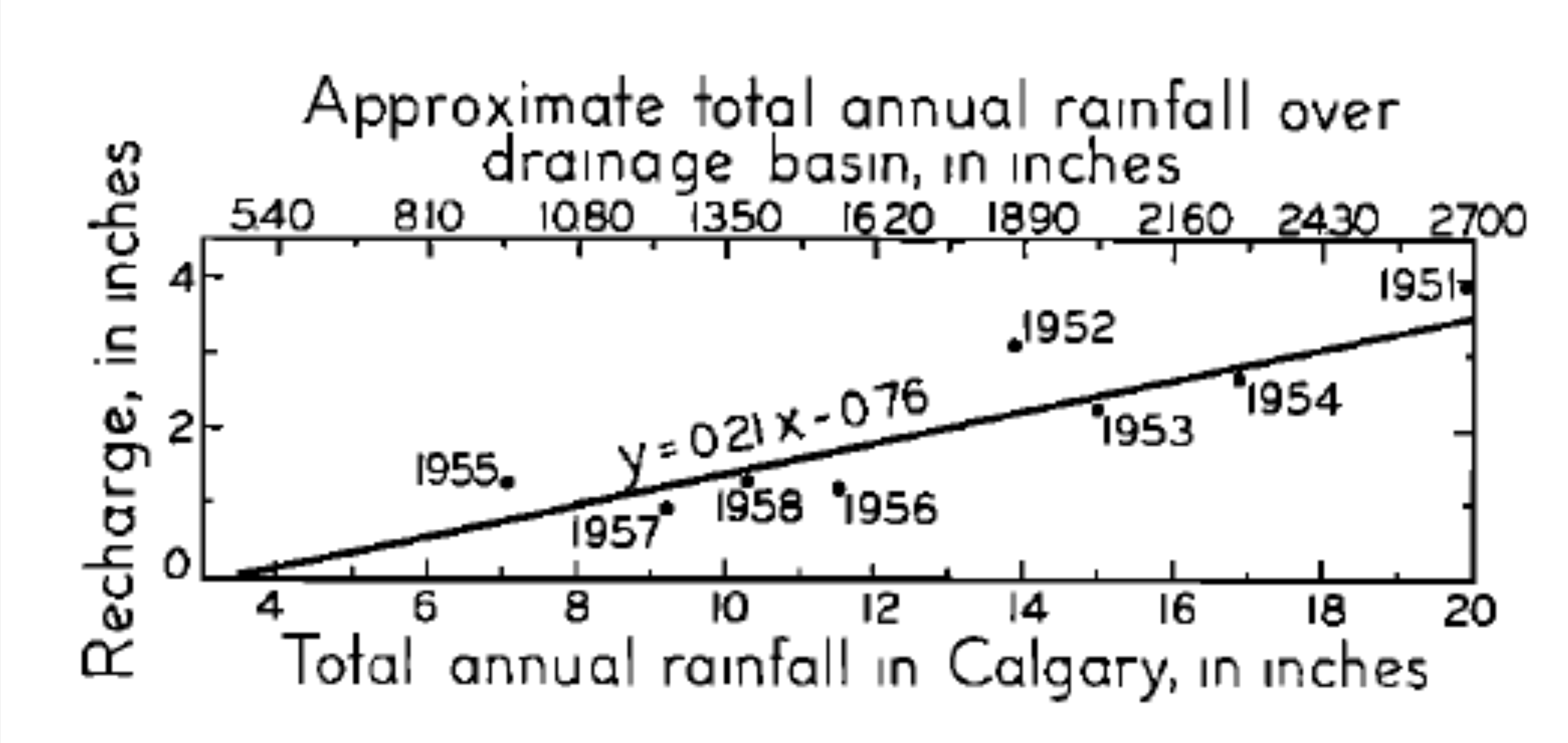
2e+09 ft^3/[1150000 sq mi * 5280 $(ft/mi)^2$] = 0.33 ft

0.33[ft]/3[ft/m]=0.1=10%

So 10% of the rainfall replenished the aquifer for that year

Recession Method

Example:



Meyboom, 1961, JGR

$$y = 0.21x - 0.76$$