













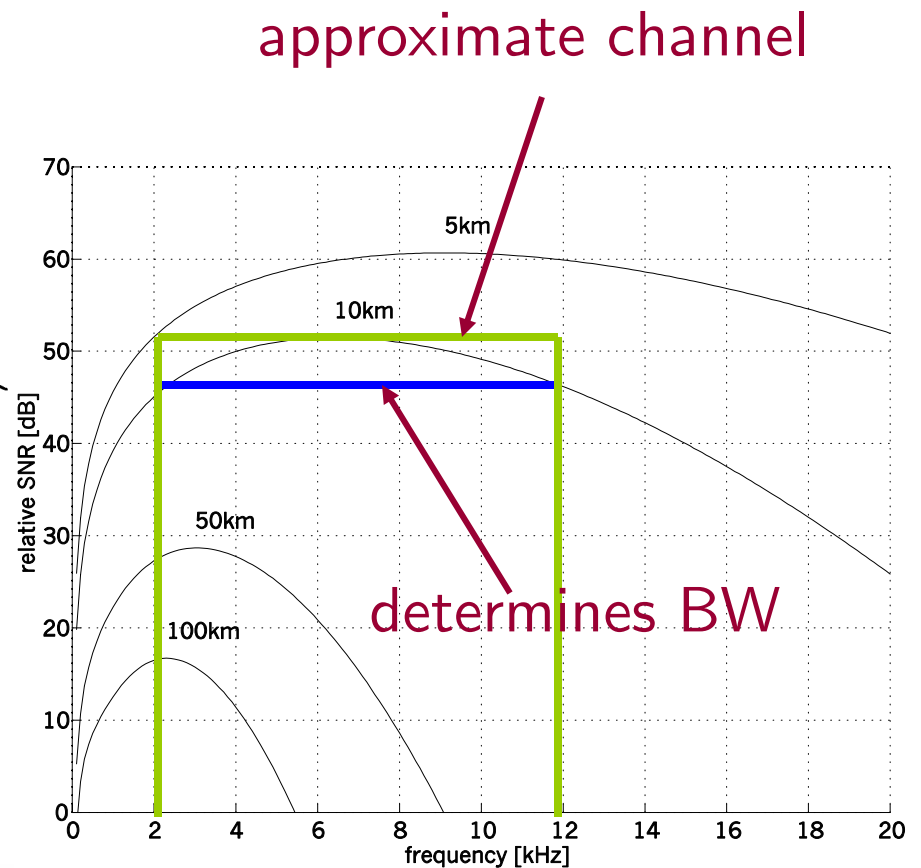






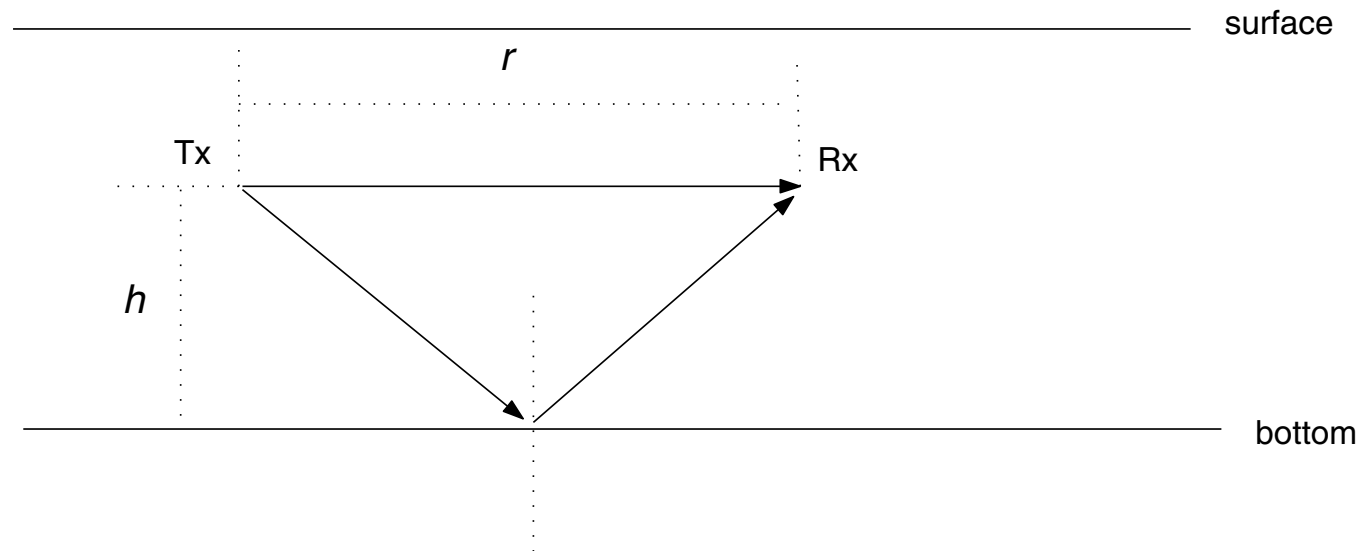
# Approximate Link Model

- “Flat” channel
  - flat around 3 dB bandwidth
  - SINR from 3 dB bandwidth
  - AWGN (true is colored 1/f)
- Overall link error exponent  
random coding exponent
  - conservative
  - $(\text{BW}, \text{SNR}) \uparrow \rightarrow E \uparrow$



# Shallow-Water Multipath Model

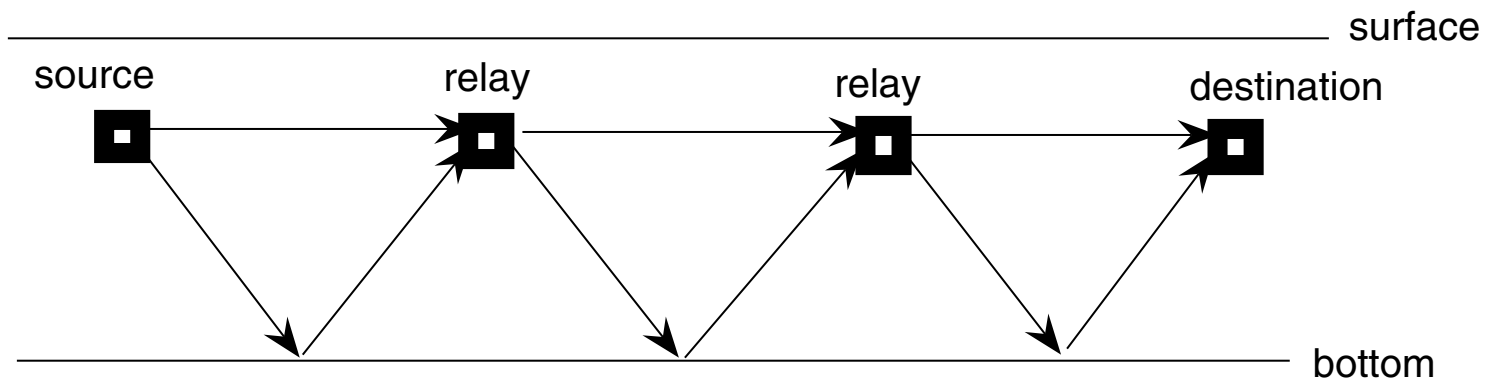
- Cannot ignore intersymbol interference (ISI) induced by multipath
  - characterize through determination of delay spread via geometry
  - consider LOS and bottom reflected path only (largest delay path)
  - shallow water assumption  $r \gg h$



- Delay spread determines guard intervals for ISI avoidance
  - delay spread,  $\lambda$ , is a function of the inter-node distance

# Multihop Transmission

- Source-destination  $d$  km apart
- Regular  $K$ -hop network:  $K$  relay nodes uniformly located between  $S$  and  $D$
- Hop characteristics identical, determined by length:  $d/K$  km



- for fixed  $d$ , fixed,  $h$  as  $K$  increases, relative delay spread increases















