To project UTC arrival time to $t=0$: SUBTRACT t_{adj}

(A4) $t^*_{aKI3S} = t_{aKI3S} + t_{adj}$

$t^*_{aKI3S} = t_{t=1500}$, $t_{aKI3S} = t_{t=0}$

$\therefore \; t_{t=1500} = t_{t=0} + t_{adj}$

$$t_{t=0} = t_{t=1500} - t_{adj}$$

To project a travel time or ~~observation~~ arrival time (actual or theoretical) from MERMAID @ depth to MERMAID @ the surface ($t=0$) you must remove the bathymetric time adjustment.

$$Obs_{t=1500} = evt + t_{t=1500}$$

$$= evt + t^*_{aKI3S}$$

$$= evt + t_{aKI3S} + t_{adj} \quad (1)$$

$$Obs_{t=0} = evt + t_{t=0}$$

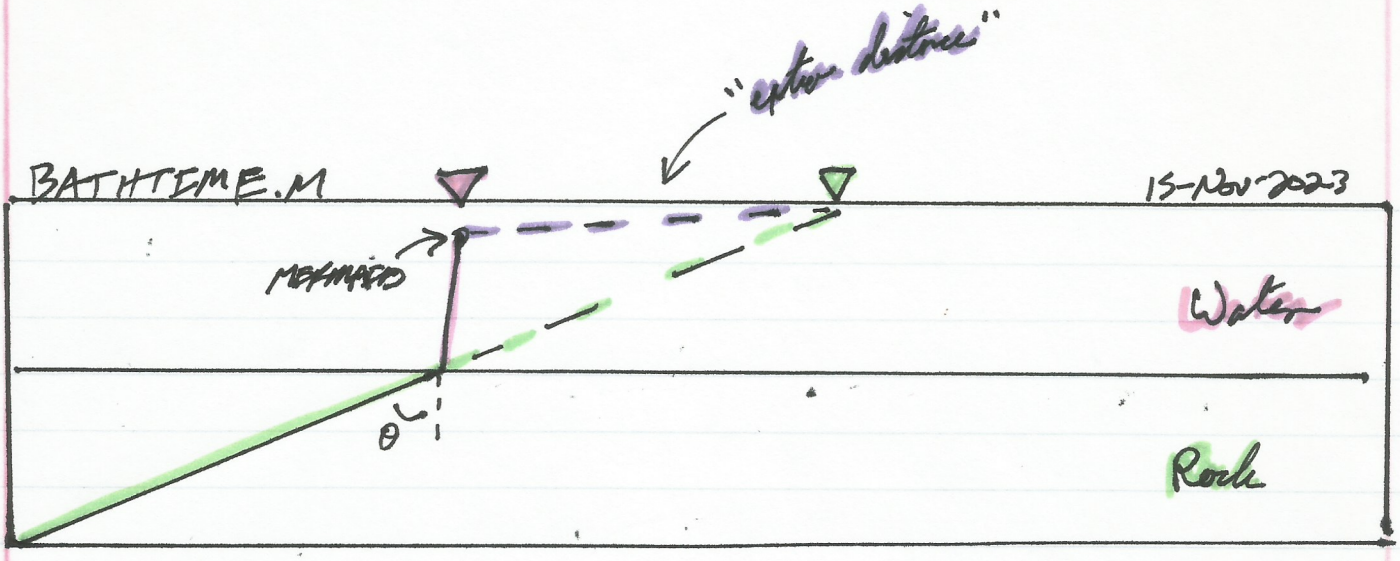
$$= evt + t_{aKI3S}$$

$$= ~~evt +~~ \quad (2)$$

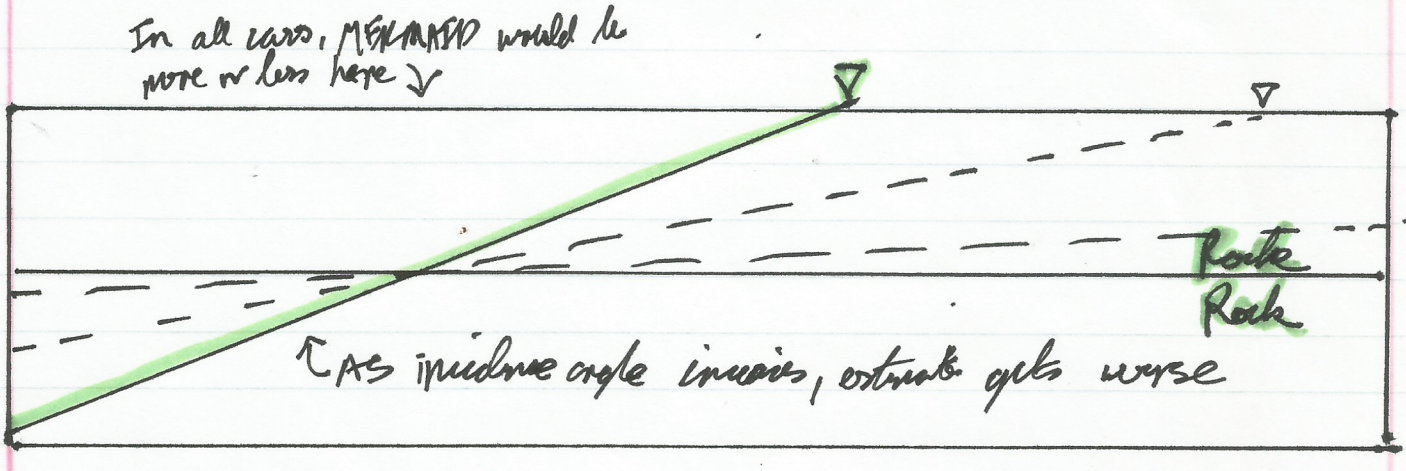
$$Obs_{t=0} \overset{(2)}{=} evt + t_{aKI3S} = Obs_{t=1500} - t_{adj} \overset{(1)}{=} (evt + t_{aKI3S} + t_{adj}) - t_{adj} \checkmark$$

$$Obs_{t=0} = Obs_{t=1500} - t_{adj}$$

- UTC of observation projected as if MERMAID @ surface ($t=0$)
- bathymetric time correction (usually positive)
- Actual observation in UTC @ depth



BATHTIME.M is a bad estimate when the incidence angle, θ, is high (close to 90°), because it compares against the travel time of that same incidence traveling through rock. So it is wrong because the station location projected on the surface is different (farther / more distance traveled).



The extra distance can be considered in the limit -- @ 90° incident angle the ray would never reach surface / have infinite travel time

Ergo: BATHTIME is a poor estimator for local events!