Direction of light
from the Pole star (Polaris) — overhead for
an observer at the (geographical) North pole.

Horizon for an observer
at a latitude of $\theta(^\circ)$ North

Horizon for an observer
at the (geographical)
North pole

ϕ is the angular
displacement, above the
horizon, for an
observer at a latitude
of $\theta(^\circ)$ North

R_E

Horizon for
an equatorial
observer. Polaris
would be on this
observer's horizon.

Zenith

Axis of the Earth,
at an angle of $23 \cdot (5)^\circ$
with the vertical
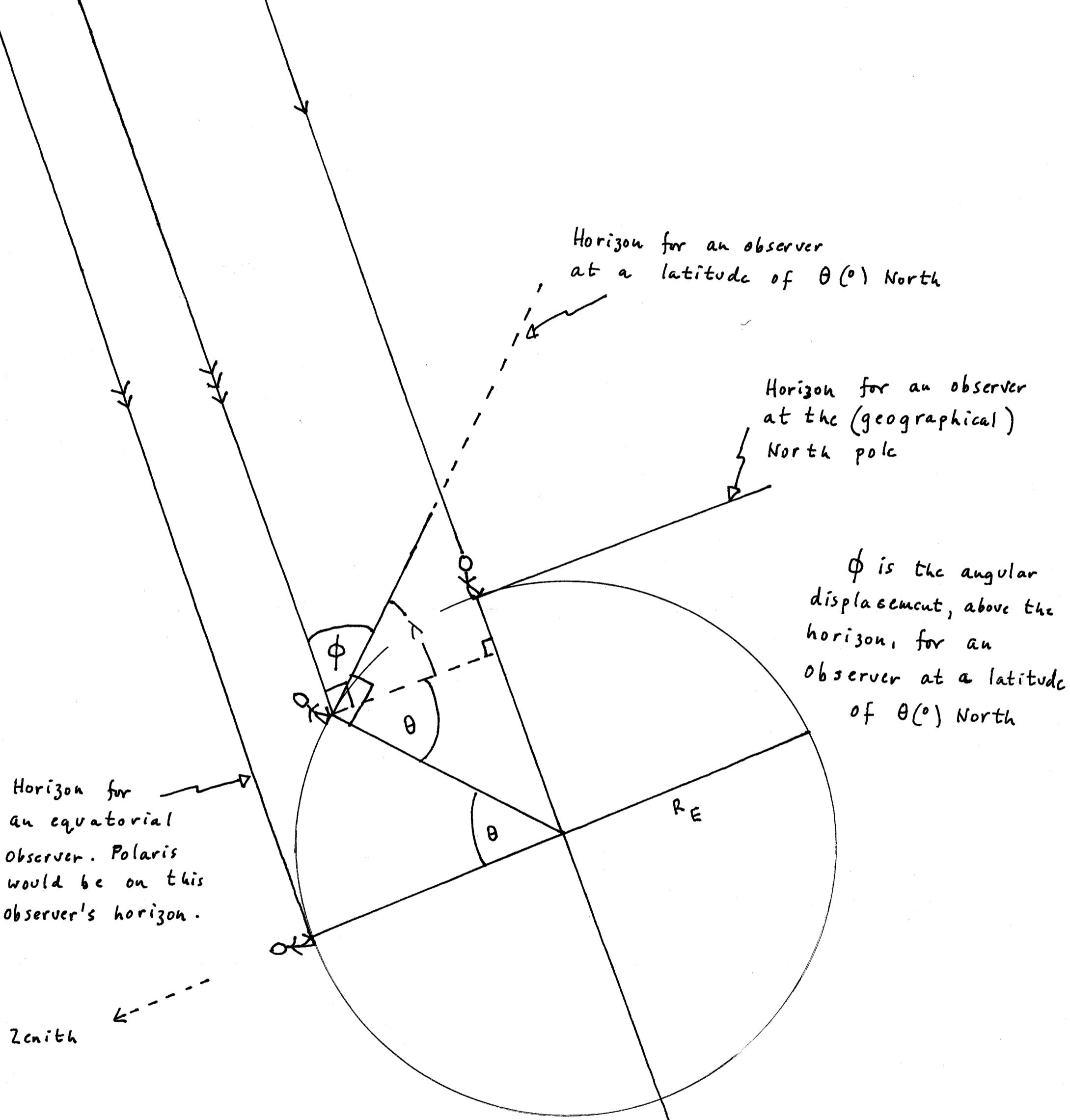
From the above diagram,

$$\angle \theta + \angle \lambda = 90^\circ \quad\text{———①}$$

Also,

$$\angle \phi + \angle \lambda = 90^\circ \quad\text{———②}$$

Combining ① and ②,

$$\Rightarrow \quad \underline{\underline{\angle \phi = \angle \theta}}$$

The angle between the observer's horizon
and the direction of light from Polaris,
is the observer's latitude.