THE SPEED OF NOON

The Speed of Noon at the Equator

As the Earth spins "beneath" the sun, the sun is directly over different points on Earth through the day. Thus "noon" travels around the Earth at some speed. It travels all the way around the Earth in one day. On the equinoxes it travels along the equator where Earth's radius is $6.4 \times 10^6 \text{ m}$, so calculate the speed of noon:

$$v_{\text{noon at equator}} = \frac{2\pi R_{\text{equator}}}{24 \text{ hours}} = \frac{2\pi (6.4 \times 10^6 \text{ m})}{24(60)(60)\text{ sec}} = 465 \frac{\text{m}}{\text{s}}$$

or, taking $1 \frac{\text{m}}{\text{s}} = 2.24 \text{ mph}$, the speed of noon along the equator is

$$v_{\text{noon at equator}} = 1042 \text{ mph}$$

B. Terminator Speed in Canton

The terminator is the edge of the Earth's shadow on itself, that is, the edge of night or sunset and sunrise. Sunrise and sunset occur when the terminator passes your position on Earth. Since we don't stand at the equator, the distance traveled by the terminator that passes over SLU is smaller than the distance traveled by the terminator at the equator. The rotational radius (the radius from the axis of rotation) of the Earth at Canton is $R_{\text{equator}} \times \cos(44.6^\circ)$ since Canton is at a latitude of $44.6^\circ$. Hence the velocity of the terminator (or noon) at Canton is less than that at the equator. Calculate the speed of the terminator at Canton:

$$v_{\text{noon in Canton}} = \frac{2\pi [R_{\text{equator}} \cos(44.6^\circ)]}{24 \text{ hr}} = \frac{2\pi [(6.4 \times 10^6 \text{ m}) \cos(44.6^\circ)]}{24(60)(60)\text{ sec}} = 331 \frac{\text{m}}{\text{s}}$$

$$v_{\text{noon in Canton}} = 742 \text{ mph}$$

MUTTS

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