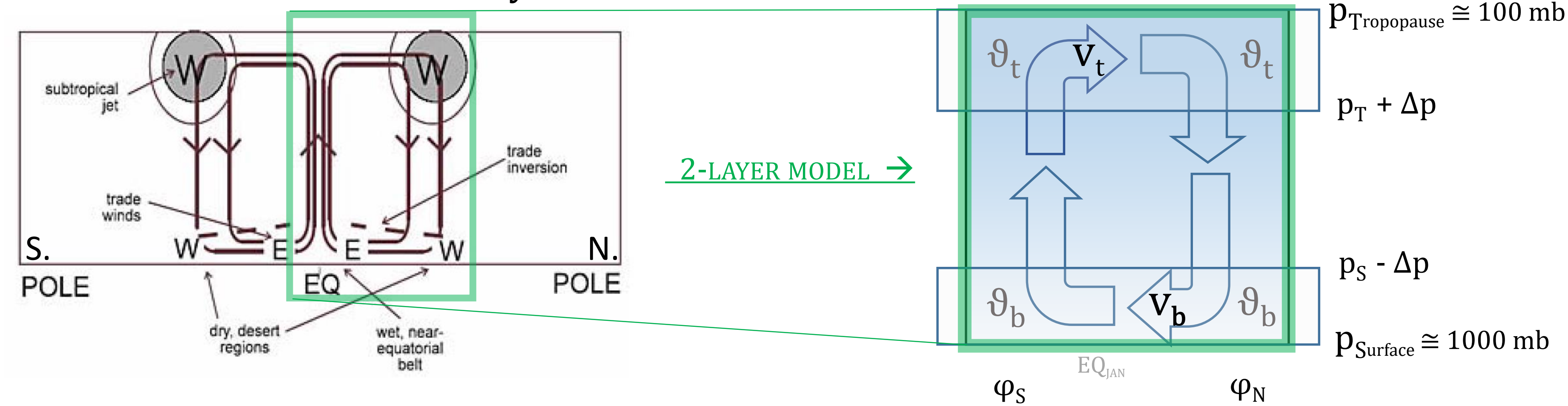
General circulation – Hadley cell



Eqns. 7 → 8 [pg. 4]

$$\mathcal{H} = \rho c_p \int_0^\infty \oint \overline{v}\overline{\vartheta} dx dz = \frac{c_p}{g} \int_0^{p_s} \oint \overline{v}\overline{\vartheta} dx dp = \frac{c_p}{g} \times 2\pi a \cos\varphi \int_0^{p_s} [\overline{v}\overline{\vartheta}]\, dp$$

Constants

Specific heat *(for atmospheric air)*

$c_p = 1005$ J/(kg K)

$g = 9.8$ m/s^2

$a \cong 6.4 \times 10^6$ m
(^ Earth's radius)

Estimate values for:

1 millibar =10^2 Pascals

$[\overline{v}$elocities]	$[\overline{\vartheta}$: potential temp.]	φ : latitude	p : pressure
$\overline{v}_t =$	$\overline{\vartheta}_t =$	$\varphi_{avg} =$	$\Delta p =$
$\overline{v}_b =$	$\overline{\vartheta}_b =$		

Eqn. 9 [pg. 8]

If $v_t \cong -v_b$ then..

$$\int_0^{p_s} [\overline{v}][\overline{\vartheta}] dp = ([\overline{v}]_t [\overline{\vartheta}]_t + [\overline{v}]_b [\overline{\vartheta}]_b)\Delta p = [\overline{v}]_t ([\overline{\vartheta}]_t - [\overline{\vartheta}]_b)\Delta p$$

→ Express $\mathcal{H}$ in Petawatts, PW=10^{15} W.