Table S1. Compilation of water-vapor mass transfer coefficients from the literature (selection).

<table>
<tr><td colspan="2">Vapor-pressure based formulation of Daltons evaporation formula (e.g., Wüst 1920, Sutton and Simpson 1934, Sverdrup 1937, Tomczak 1939, Jacobs 1942, 1951, DWA 2018) [22, 93, 175, 95, 91, 92, 107]</td></tr>
<tr><td>$E = \frac{J_E}{\varrho_W} = \frac{J_q}{\varrho_W L_V} = D_e\left[e_{eq}(S_A, T) - e\right]$

$D_e = a(1 + 3.66 \cdot 10^{-3}\,\vartheta/°\mathrm{C})(1 + bU/(\mathrm{km\ h^{-1}}))$
$a = (4.6 - 5.64) \cdot 10^{-11}\ \mathrm{m^2 s\ kg^{-1}}, \quad b = 0.075 - 0.11$

$D_e = a(U/U_R), \;\; a = (0.94 - 1.24) \cdot 10^{-11}\ \mathrm{m^2 s\ kg^{-1}}$

$D_e = \omega[a + b(U/U_R)^{\varepsilon}],$
$\omega = 8.7 \cdot 10^{-11}\ \mathrm{m^2 s\ kg^{-1}}, \;\; a = 0.16, \;\; b = 0.18, \;\; \varepsilon = \frac{2 - n_{turb}}{2 + n_{turb}} = 0.84$

$D_e = f_U(U)$</td><td>

Wüst (1920, pp. 39-41) [22]

Jacobs (1942, 1951) [91, 92]

Sutton and Simpson (1934), Tomczak (1939) [93, 95]

Compilation of different wind functions: Vietinghoff (2000, pp. 51-60), DWA (2018, p. 117, Table 15) [106, 107]</td></tr>
<tr><td colspan="2">Specific-humidity based formulation of Daltons evaporation formula (e.g., Budyko 1963, pp. 74-76, Eqs. (68), (69), (73), Sellers 1965, p. 145, Eq. (10.9), Kondo 1975, Eq. (2), Liu et al. 1979, Eq. (1b), Foken 1984, Eq. (10), Smith 1988, Eq. (3), Pal Arya 1988, p. 188, Eq. (12.13), Kondo et al. 1990, Eqs. (1), (2), Ruprecht and Simmer 1991, Section 2, Schmugge and André 1991, p. 72, Eqs. (4.6)-(4.8), Garratt 1992, p. 56, Eq. (3.51), Miller et al. 1992, Eq. (1), Kraus and Businger 1994, pp. 180–181, Kaimal and Finnigan 1994, p. 13, Eq. (1.17), p. 70, Eq. (3.13), Zhang and McPhaden 1995, Eq. (1b), Stull 1997, p. 263, Eq. (7.4.1e), Fairall et al. 2003a, Liu et al. 2007, Yu 2007, Eq. (1), Stewart 2008, p. 58, Eq. (5.10c), Table 5.1, Liu et al. 2013, Eq. (5), Rosenberg 2016, Eq. (2), Kumar et al. 2017, Eq. (1), Cronin et al. 2019, Eq. (1.6b), Yu 2019, Eq. (3), Hogan 2020, Reeves Eyre et al. 2021, Eq. (3), Table 1, Song et al. 2022, Eq. (1)) [27, 26, 160, 161, 164, 155, 111, 176, 177, 113, 114, 156, 45, 115, 178, 116, 133, 179, 180, 30, 158, 181, 182, 11, 142, 183-185]</td></tr>
<tr><td>$J_q = \varrho_{AV} L_V D_q\left[q_{eq}(S_A, T) - q\right], \qquad D_q = C_E U$

$D_q = \frac{K_m U}{U\delta_m + \frac{K_m}{\kappa^2}\left(\frac{z_1 + z_0}{z_0}\right)^2}, \qquad \delta_m = (1 - 1.5) \cdot 10^{-3}\ \mathrm{m}, \quad \kappa = 0.4$</td><td>Sverdrup (1936), Budyko (1963, Eq. (69)) [23, 27]</td></tr>
</table>

$D_q = a + b\left(\frac{U}{U_R}\right),\ \ a = \begin{cases}(7-45)\cdot 10^{-4}\ \mathrm{m\ s^{-1}} & \text{general range}\\ 7\cdot 10^{-4}\ \mathrm{m\ s^{-1}} & \text{for large lakes}\end{cases}$ $b = 2\cdot 10^{-3}\ \mathrm{m\ s^{-1}}$	Sellers (1965, p. 159, Eq. (11.2)) [26]
$D_q = 5\cdot 10^{-3}\ \mathrm{m\ s^{-1}}$	Kaimal and Finnigan (1994, pp. 73-76, Eq. (3.21), Table 3.1) [115]
$D_q = \dfrac{\kappa u_*}{\kappa\,\mathrm{Pr}_m\,\hat{\delta}_{m,q} + 4\,\kappa + \ln\left(\frac{\zeta_c\,L\,u_*}{20\,K_{m,U}}\right) + \frac{1}{n}\left[1-\left(\frac{z}{\zeta_c\,L}\right)^{-n}\right]}$	Foken (1984, Eq. (10)) [164]
$\hat{\delta}_{m,q} = \dfrac{\delta_{m,q}u_*}{K_{m,U}} = 6, \qquad \{\zeta_c, n\} = \begin{cases}\{-0{,}075, 0.5\}, & -2.5 \le \zeta \le -0.075\\ \{0.16, -2\}, & 0.16\ \le \zeta \le 1\end{cases}$	Skeib and Richter (1984) [151]
Specific-humidity based formulation of Daltons evaporation formula with correction for subsurface sea-temperature effects according to Kruspe (1977, Eq. (3), Fig. 2) [186]	
$J_q = \varrho_{AV}\ L_V\left[C_q\ U_{10}\ \left[q_{eq}(S_A, T) - q_{10}\right] + b_{\mathrm{corr}}\right],\ \ C_q \times 10^3 = 1.36 \pm 0.25,\ \ b_{\mathrm{corr}} = -0.7\cdot 10^{-5}\ \mathrm{m\ s^{-1}}$	
Formulations of the Dalton number for neutral, stable, and unstable stratification from different sources	
$C_q^N \times 10^3 = \begin{cases} 1.15\\ 1-5\\ 1.1\ (\pm 15\%)\\ 1.2\\ (1.1-1.2)@U < 10\ \mathrm{m\ s^{-1}},\ \ 1.45@U \approx 20\ \mathrm{m\ s^{-1}}\\ 1.2-1.5\\ 1.3\end{cases}$	Large and Pond (1982, Table 2, for unstable conditions) [124] Stull (1997, p. 263, Eq. (7.4.1e)) [116] Garratt (1992, pp. 101-104, Fig. 4.9) [114] Smith (1988, best estimate from compilation of empirical data), Kraus and Businger (1994, p. 181 for $U = (5-20)\ \mathrm{m\ s^{-1}}$), Stewart (2008, Table 5.1), Hogan (2020, Eq. (29)) [155, 45, 30, 183] Fairall et al. (2003a, Fig. 3) [133] Liu et al. (2007, Table 3) [179] Kumar et al. (2017, Eq. (1)) [182]
$C_q =$ LUT as function of U and $\Delta T = T_A - T_{SST}$	Bunker (1976, Table 4) [187]
$C_q = C_q^N \times \begin{cases}(1-\zeta)\left[1 + 10^{-2}\,\beta^{3/4}\right] & \text{at } \zeta < 0 \text{ (unstable)}\\ \left[\frac{1}{1+3.5\,\zeta}\right]\left[1 + 10^{-2}\,\beta^{3/4}\right] & \text{at } \zeta > 0 \text{ (stable)}\\ \zeta = \frac{z}{L},\ \ z_0 = z\exp\left(-\frac{\kappa\,U}{u_*}\right),\ \ \beta = \frac{z_0\,u_*}{\nu} & \end{cases}$	Panin et al. (2006, for deep-water air-sea interaction) [188]

$C_q = \dfrac{\kappa^2}{\left[\ln \dfrac{z}{z_0} - \Psi_U(\zeta)\right]\left[\ln \dfrac{z}{z_0} - \Psi_q(\zeta)\right]}, \qquad \zeta = \dfrac{z}{L}$ $C_q = \dfrac{\kappa^2}{\left[\ln \dfrac{z}{z_0} - \Psi_U(\zeta) + \Psi_U(\zeta_0)\right]\left[\ln \dfrac{z}{z_0} - \Psi_q(\zeta) + \Psi_q(\zeta_0)\right]}, \ \zeta = \dfrac{z}{L}, \ \zeta_0 = \dfrac{z_0}{L}$ $\Psi_U(\zeta) = \begin{cases} -5\zeta & \text{for } \zeta \geq 0 \\ \ln\left[\left(\dfrac{1+x^2}{2}\right)\left(\dfrac{1+x}{2}\right)^2\right] - 2\arctan x + \dfrac{\pi}{2} & \text{for } \zeta < 0 \end{cases}$ $\Psi_T(\zeta) = \Psi_q(\zeta) = \begin{cases} -5\zeta & \text{for } \zeta \geq 0 \\ 2\ln\left(\dfrac{1+x^2}{2}\right) & \text{for } \zeta < 0 \end{cases}$ $x = (1 - 15\,\zeta)^{1/4}$	Pal Arya (1988, p. 167, Eq. (11.16)), Garratt (1992, p. 55, Eqs. (3.47)-(3.51)), Stull (1997, p. 267, Eq. (7.4.1m)) [111, 114, 116] Liu et al. (2013, Eqs. (7), (8)) [158] Stability functions for momentum and scalars (e.g., Paulson 1970, Pal Arya 1988, p. 167, Eq. (11.14), Zhang and McPhaden 1995) [145, 111, 178]

Parameterization of the Dalton number according to Kondo (1975) on the base of the Owen-Thomson theory of evaporation (Owen and Thomson 1963) (see also Garratt (1992, pp. 90-93) for interfacial sublayer relations) [160, 159, 114]

(A) Parameterization for neutral (adiabatic) stratification (Kondo 1975, Fig. 5, Appendix 1, Table A1) [160]

$$C_q^N(10\ m) \times 10^3 = a_q + b_q\left(\frac{U_{10}}{U_R}\right)^{p_q} + c_q\left[\frac{U_{10}}{U_R} - 8\right]^2$$

$U_{10}/(\mathrm{m\ s^{-1}})$	a_q	b_q	c_q	p_q
0.3-2.2	0	1.23	0	-0.16
2.2-5	0.969	0.0521	0	1
5-8	1.18	0.01	0	1
8-25	1.196	0.008	-0.0004	1
25-50	1.68	-0.016	0	1

(B) Parameterization for diabatic stratification (Kondo 1975, Appendix 3) [160]

$$C_q \approx C_q^N \times \begin{cases} 0.01 + 0.03\hat{S} + 0.9\exp\left(4.8\hat{S}\right) & \text{for } T_{SST} - T < 0 \text{ and } -3.3 < \hat{S} < 0 \text{ (stable stratification)} \\ 0 & \text{for } T_{SST} - T < 0 \text{ and } \hat{S} \le -3.3 \text{ (very stable stratification)} \\ 1.0 + 0.63\hat{S}^{1/2} & \text{for } T_{SST} - T > 0 \text{ (unstable stratification)} \end{cases}$$

$$\hat{S} = \hat{S}_0 \frac{|\hat{S}_0|}{|\hat{S}_0| + 0.01}, \qquad \hat{S}_0 = \frac{S_0}{S_R}, \qquad S_0 = \frac{T_{SST} - T}{\left(U\left[1.0 + \log_{10}\left(\frac{10\text{ m}}{z}\right)\right]\right)^2}, \quad S_R = 1\text{ K (m/s)}^{-2}$$

Parameterization of the Dalton number according to Miller et al. (1992, Eqs. (2), (3), Fig. 3) [156]

$$C_q = C_q^N F_q\left(\mathrm{Ri}_o, \frac{z_1}{z_0}, \frac{z_1}{z_{0,T}}, \frac{z_1}{z_{0,q}}\right), \qquad C_q^N = \frac{\kappa^2}{\left[\ln \frac{z_1}{z_0}\right]\left[\ln \frac{z_1}{z_{0,q}}\right]}$$

Rough-wind regime (Charnock relation)

$$z_0 = \max\left(0.018\,\frac{u_*^2}{g},\ 1.15 \cdot 10^{-5}\text{ m}\right)$$

Weak-wind regime (smooth surface)

$$z_0 = 0.11\frac{\nu}{u_*} + 0.018\frac{u_*^2}{g}, \qquad z_{0,T} = 0.40\frac{\nu}{u_*} + 1.4 \cdot 10^{-5}\text{ m}, \qquad z_{0,q} = 0.62\frac{\nu}{u_*} + 1.3 \cdot 10^{-4}\text{ m}$$

Free-convection limit of ocean evaporation

$$J_q = \varrho_{AV}\, L_V\, D_q'\left[q_{eq}(S_A, T) - q_1\right], \qquad D_q' = 0.17\left(\frac{g\,\alpha_m^2}{\nu\,\theta_v}\right)^{1/3}\left(\theta_{v,s} - \theta_{v,1}\right)^{1/3}$$

Dalton number with consideration of the free-convection limit

$$C_q = C_q^N\left(1 + C_R^\gamma\right)^{1/\gamma}, \quad C_q^N = \left(\frac{\kappa}{\ln(z_1/z_0)}\right)^2, \quad C_R = \frac{\eta}{C_q^N U_1}\left(\theta_{v,s} - \theta_{v,1}\right)^{1/3}$$

$\gamma = 1.25$, $\eta = 0.0016$ m s^{-1}K$^{-1/3}$, $z_0 =$ from the Charnock formula

Parameterization of Dalton number according to Large and Yeager (2004, Eq. (6)) [126]
$C_q \times 10^3 = \begin{cases} 18.0\sqrt{C_U} & \text{for } \zeta > 0 \\ 32.7\sqrt{C_U} & \text{for } \zeta \leq 0 \end{cases}, \quad C_U \times 10^3 = \frac{2.7\ \mathrm{m\ s^{-1}}}{U_{10}} + 0.142 + \frac{U_{10}}{13.09\ \mathrm{m\ s^{-1}}}$
Parameterization of Dalton number according to Large and Yeager (2009) [127]
$C_q^N = \frac{\kappa\sqrt{C_U^N}}{\ln(10\ \mathrm{m}/z_{0,q})}, \quad C_U^N = \begin{cases} \frac{a_1}{\hat{U}_{10}} + a_2 + a_3\hat{U}_{10} + a_8[\hat{U}_{10}]^6 & \text{for } \hat{U}_{10} \geq 33 \\ 0.00234 & \text{for } \hat{U}_{10} < 33 \end{cases}$ $\hat{U}_{10} = \frac{U_{10}}{U_R}, \quad U_R = 1\ \mathrm{m\ s^{-1}}, \quad a_1 = 2.7 \cdot 10^{-3}, \quad a_2 = 1.42 \cdot 10^{-4}, \quad a_3 = 7.64 \cdot 10^{-5}, \quad a_8 = -3.14807 \cdot 10^{-13}$ $\frac{\kappa}{\ln(10\ \mathrm{m}/z_{0,q})} = 0.0346$
Parameterization of the wind function $\xi(U)$ in dependence on the wind velocity, the difference between water and air temperatures, and on the humidity deficit according to Babkin (2023, Eq. (1)) [189]
$E = \xi(U)\, U\, [q_{eq}(S_A, T) - q]$