961
962 **Figure 1**. Horizontal flux vs. Lateral cover for field experiments *(a, b)* and model prediction *(c)*.
963 *(a)* data from individual storms from Owens Dry Lake [*Lancaster and Baas,* 1998], *(b)* data from
964 two seasons in the Chihuahuan Desert [*Li et al.,* 2007], and *(c)* estimates of total horizontal flux
965 using the shear-stress partitioning model of *Raupach et al.* [1993] and the flux equation of *Shao*
966 *and Raupach* [1992] using two values of *m*, 0.5 and 1.0. Light lines are horizontal flux estimated
967 at constant shear velocity (1.0 m s^{-1}) and heavy lines are flux estimates for actual wind speed
968 records of the Jornada Experimental Range in New Mexico from 1997 to 2001. Figure redrawn
969 from *Okin* [2008].

970

970
971 **Figure 2**. An example of a histogram of the scaled gap size, constructed based on the size of a
972 gap and the height of an adjacent plant canopy for all gaps and canopies along three 50-m
973 transects at each site.

974

974
975 **Figure 3**. Relationship between z'_o and z_o given by Equation (12) and used for the determination

976 of roughness length in the MOK model.

977

977
978 **Figure 4**. Frequency distribution of windspeeds used in the mass flux modeling for major study
979 sites. More details related to the characteristics of the study sites may be found in Tables 1 and
980 S1.

981

981
982 **Figure 5**. Horizontal mass flux (Q_t, act, g m-1 d-1) measured by BSNEs located in the major
983 study sites. More details of the study sites are listed in Table 1.

984

Figure 6. Expected error, plotted as ε_r, when u_{*t} and mean wind speed are uncertain. The degree of uncertainty is estimated using the coefficient of variation (CV). A) the surface plots ε_r against CV of mean wind speed and u_{*t}. The surface has been interpolated. B) ε_r plotted against the sum of the CVs of mean wind speed and u_{*t}.