

Instructor: Michael Lamb; mpl@gps.caltech.edu

Time: Fridays 3-5 pm

Place: Arms 267

Description: Each student will lead or co-lead a paper discussion. In addition, every participant is expected to read all assigned papers and come prepared with three questions or comments each week. We will go on an optional field trip to see some wind-erosion features.

Assessment: Grades will be based on 80% participation during paper discussions (10% per class) plus an additional 20% for the day of the student led presentation.

FIELD TRIP: 3/7 - Mojave Preserve - see Laity and Bridges field guide

[Note on other possible field locations: Ocatillo Wells, Rogers Lake, Tecopa Basin (SE of Shoshone), Garnet Hill (see Greeley book)]

MEETING DAYS

[DOWNLOAD ALL PAPERS](#)

Jan 9 -

Alistair Hayden

Anderson, R.S., 1986. Erosion profiles due to particles entrained by wind: Application of an eolian sediment transport model. *Geological Society of America Bulletin* 97, 1270-1278. [PDF](#)

Bridges and Laity; Shroder, John F., ed. *Treatise on geomorphology*. Vol. 1. Academic Press, 2013.(Chapter 11.8: *Fundamentals of Aeolian Sediment Transport: Aeolian Abrasion*) [PDF](#)

Jan 16 -

Jeff Prancevic

Greeley, R., Iversen, J.D., 1985. Wind as a geological process on Earth, Mars, Venus and Titan. New York: Cambridge University Press.: Chapter on Wind Abrasion [PDF](#)

Anderson, Robert S., and Bernard Hallet. "Sediment transport by wind: toward a general model." *Geological Society of America Bulletin* 97.5 (1986): 523-535. [PDF](#)

Jan 23 – No Class

Jan 30 –

Joel

*Sharp, R. P., 1964, Wind-driven sand in Coachella Valley, California. *Geol. Soc. Am. Bull.* 74: 785–804 [PDF](#)

Sharp, R. P. (1980). "Wind-driven sand in Coachella Valley, California: further data." *Geological Society of America Bulletin* 91(12): 724-730. [PDF](#)

*Wang, Z.-T., Wang, H.-T., Niu, Q.-H., Dong, Z.-B., and Wang, T., 2011. Abrasion of yardangs. *Physical Review E*, 84, 031304. [PDF](#)

Feb 6 –

Austin

*Ward, A.W., Greeley, R., 1984. Evolution of the yardangs at Rogers Lake, California. *Geological Society of America Bulletin* 95, 829-837. [PDF](#)

Mackay, J. R. and C. R. Burn (2005). "A long-term field study (1951-2003) of ventifacts formed by katabatic winds at Paulatuk, western Arctic coast, Canada." *Canadian Journal of Earth Sciences* 42(9): 1615-1635. [PDF](#)

Kok, J. F. (2010), Difference in wind speeds required for initiation versus continuation of sand transport on Mars: Implications for dunes and dust storms, *Physical Review Letters*, 104, 074502. [PDF](#).

Feb 13 – Julie Laity (CSUN) Presentation

*Laity, J.E., Bridges, N.T., 2009. Ventifacts on Earth and Mars: Analytical, field, and laboratory studies supporting sand abrasion and windward feature development. *Geomorphology* 105, 202-217. [PDF](#)

Feb 20 –

Alistair

Bristow, C. S., et al. (2009). "Deflation in the dustiest place on Earth: The Bodélé Depression, Chad." *Geomorphology* 105(1–2): 50-58. [PDF](#)

Greeley, R., Iversen, J.D., 1985. Wind as a geological process on Earth, Mars, Venus and Titan. New York: Cambridge University Press. Chapter: Interaction of topography and wind direction. [PDF](#)

- * Rohmann et al., Wind as the primary driver of erosion in the Qaidam Basin, China, EPSL, [PDF](#)

Feb 27 – Nathan Bridges (Johns Hopkins/APL) Presentation

Mathieu

- * Greeley, R. et al. Rate of wind abrasion on Mars. J. Geophys. Res. 87, 10,009–10,024 (1982).
[PDF](#)

- * **11.14 Abraded Systems.** *Pages 269-286*, J.E. Laity, N.T. Bridges [PDF](#)

Farley et al., Science ?

Mar 6 – Jon Perkins guest speaker

Perkins et al.

Other Papers we could read

Reviews

Goudie, A.S., 2008. The history and nature of wind erosion in deserts, Ann. Rev., 36, 97-117.
[PDF](#)

Greeley, R., Iversen, J.D., 1985. Wind as a geological process on Earth, Mars, Venus and Titan.
New York: Cambridge University Press.

[PDF - chapter 4: aeolian abrasion and erosion](#)

[PDF - chapter 6: interaction of wind and topography](#)

Jasper Knight, The environmental significance of ventifacts: A critical review, Earth-Science Reviews, Volume 86, Issues 1–4, January 2008, Pages 89-105 [PDF](#)

Wind and Dust transport Modeling

Kok, J. F., E. J. R. Parteli, T. I. Michaels, and D. Bou Karam (2012), The physics of wind-blown sand and dust, Reports on Progress in Physics, 75, 106901 (72 pp). [PDF](#).

Kok, J. F., and N. O. Renno (2009), A comprehensive numerical model of steady-state saltation (COMSALT), *Journal of Geophysical Research – Atmospheres*, 114, D17204. [PDF](#).

Almeida, M. P., et al. (2008). "Giant saltation on Mars." *Proceedings of the National Academy of Sciences* 105(17): 6222-6226. [PDF](#)

Wind abrasion modeling

Ayotte, K.W., Hughes, D.E., 2004. Observations of boundary-layer wind-tunnel flow over isolated ridges of varying steepness and roughness. *Boundary Layer Meteorology* 112, 525-556. [PDF](#)

Sipos, András A., Gábor Domokos, Andrew Wilson, and Niels Hovius. "A Discrete Random Model Describing Bedrock Profile Abrasion." *Mathematical Geosciences* 43, no. 5 (July 1, 2011): 583–91. doi:10.1007/s11004-011-9343-8. [PDF](#)

Várkonyi, P. L., and G. Domokos. "A General Model for Collision-Based Abrasion Processes." *IMA Journal of Applied Mathematics* 76, no. 1 (February 1, 2011): 47–56. doi:10.1093/imamat/hxq066. [PDF](#)

Sipos, A., Domokos, G., Wilson, A., Hovius, N. 2011. A Discrete random model describing bedrock profile abrasion. *Mathematical Geosciences*. 43:583-591. [PDF](#)

McKenna Neuman, C. (1989). "Kinetic energy transfer through impact and its role in entrainment by wind of particles from frozen surface." *Sedimentology* 36(6): 1007. [PDF](#)

Suzuki, T. and K. i. Takahashi (1981). "An Experimental Study of Wind Abrasion." *The Journal of Geology* 89(4): 509-522. [PDF](#)

Yardangs and wind-erosion morphology

Blackwelder, E., 1934. Yardangs: *Geological Society of America Bulletin* 45, 159-166. [PDF](#)

McCauley, J.F., Grolier, M.J., Breed, C.S., 1977. Yardangs. In *Geomorphology in arid regions*, edited by D.O. Doehring. *Proceedings, 8th Annual Geomorphology Symposium*, Binghamton, NY, pp. 233-272. [PDF](#)

Ward, A.W., 1979. Yardangs on Mars: Evidence of recent wind erosion. *Journal of Geophysical Research* 84, 8147-8166. [PDF](#)

Wilshire, H. G., J. K. Nakata and B. Hallet, 1981, Field observations of the December 1977 wind storm, San Joaquin Valley, California, *in*: T.L. Péwé, Editor, *Desert Dust: Origin, Characteristics, and Effect on Man*, *Geological Society of America Special Paper* 186: 233–251. [PDF](#)

Breed, C.S., McCauley, J.F., Whitney, M.I., 1989. Wind erosion forms, in *Arid zone geomorphology*, edited by D.S.G. Thomas. New York: Halstead Press, pp. 284 307. [PDF](#)

de Silva, S.L., Bailey, J.E., Mandt, K.E., Viramonte, J.M., 2010. Yardangs in terrestrial ignimbrites: Synergistic remote and field observations on Earth with applications to Mars. *Planetary and Space Science* 58, 459-471. [PDF](#)

Large-scale wind erosion and denudation

Kapp, P., J.D. Pelletier, A Rohrmann, R. Heermance, and J. Russell, Wind erosion in the Qaidam Basin, central Asia: Implications for tectonics, paleoclimate, and the source of the Loess Plateau, *GSA Today*, 21, 4-10, 2011. [PDF](#)

11.15 Extraterrestrial Aeolian Landscapes. *Pages 287-312*, L.K. Fenton, R.C. Ewing, N.T. Bridges, R. Lorenz [PDF](#)

[Wind erosion of layered sediments on Mars: the role of terrain](#) A 2014 proposal posted online by Edwin Kite