Dust Storms From the Sub-Saharan African Continent: Implications For Plant and Insect Dispersion in The Post-Flood World

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Abstract

Modern large-scale dust storm events provide an excellent analogy for understanding the global dispersion and repopulation of floras and insects in a post-Flood world. Through recent studies of dust storm outbreaks in western China and the sub-Saharan African continent, scientists have discovered that considerable amounts of soil and organic materials can be transported across vast regions in short periods of time. Some of the latest studies addressing massive dust storm events and their impact on the Western Hemisphere have come from the African continent.

Many dust storms today originate from the sub-Saharan African continent. The magnitude of these events is dependent upon several factors, including; storm intensity, prevailing wind patterns, and the size of the desert across which the winds blow. Tremendous volumes of dust and organic materials can be incorporated into individual dust storm events. This material can be transported across the Atlantic Ocean in a matter of days. Today, there is ongoing research into the effects that African dust storms have on the Western Hemisphere.

The Bible speaks of wind as a transport for insects and animals (accomplishing the will of God) in the books of Exodus and Numbers, so the idea of windborne transport of plants and animals should not seem foreign to the Jew or Christian. Large-scale dust storms can help the young-Earth creationist understand how the planet could be rapidly transformed from a relatively barren place to one covered by vegetation and insects. In order to do this there must be fertilized seed, a means of transport, and insects to work the new plants. All three of these factors can be supplied by a single large-scale dust storm. Modern African dust storm events provide possible insight into how the post-Flood world could have been rapidly vegetated in a manner that does not require the transportation of seed-bearing plants *only* via post-Flood ice age land bridges or water transport.

Introduction

Dust has probably existed since the creation of the heavens and the Earth. We read in Genesis Chapter 2 that "God formed man of the dust of the ground." The topic of dust has gained recent popularity with the release of an interesting book on the subject by Hannah Holmes (2001). The world's vast desert environments have been studied to better understand the interrelationship of wind, sand, and dust (Breed and Reheis, 1999; Brookfield and Ahlbrandt, 1983; Greeley and Iversen, 1985; Péwé, 1981; Pye, 1987, 1993). Dust storm events linked specifically to the African continent have also been studied and reported (Morales, 1979).

Large-scale dust storms have only recently been investigated scientifically although knowledge of these events spans thousands of years. Uniformitarian scientists believe that historically, dust storms on the African continent were more prevalent during glacial periods when the climate was more arid, rather than wet interglacial periods (Bowles, 1975; Parmenter and Folger, 1974; Pokras and Mix, 1985). Significant accumulations of quartz (derived from the African continent) in offshore sediments has lead to the conclusion that trade winds were at higher intensities during the Pleistocene (Kolla, Biscaye, and Hanley, 1979). Today's dust storm outbreaks are related to Sahelian droughts (Prospero and Nees, 1977). Soil/dust source areas can be traced to areas where deserts are expanding and strong storm fronts stir the upper ground surface that incorporates the dust within it. As these storms grow in size and strength, they increase their carrying capacity. Many of these storms have sufficient intensity to carry their loads across large bodies of water (i.e., Atlantic and Pacific Oceans) and drop their sediment and organic loads on continents in other hemi-

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Received 10 December 2002; Revised 10 January 2003

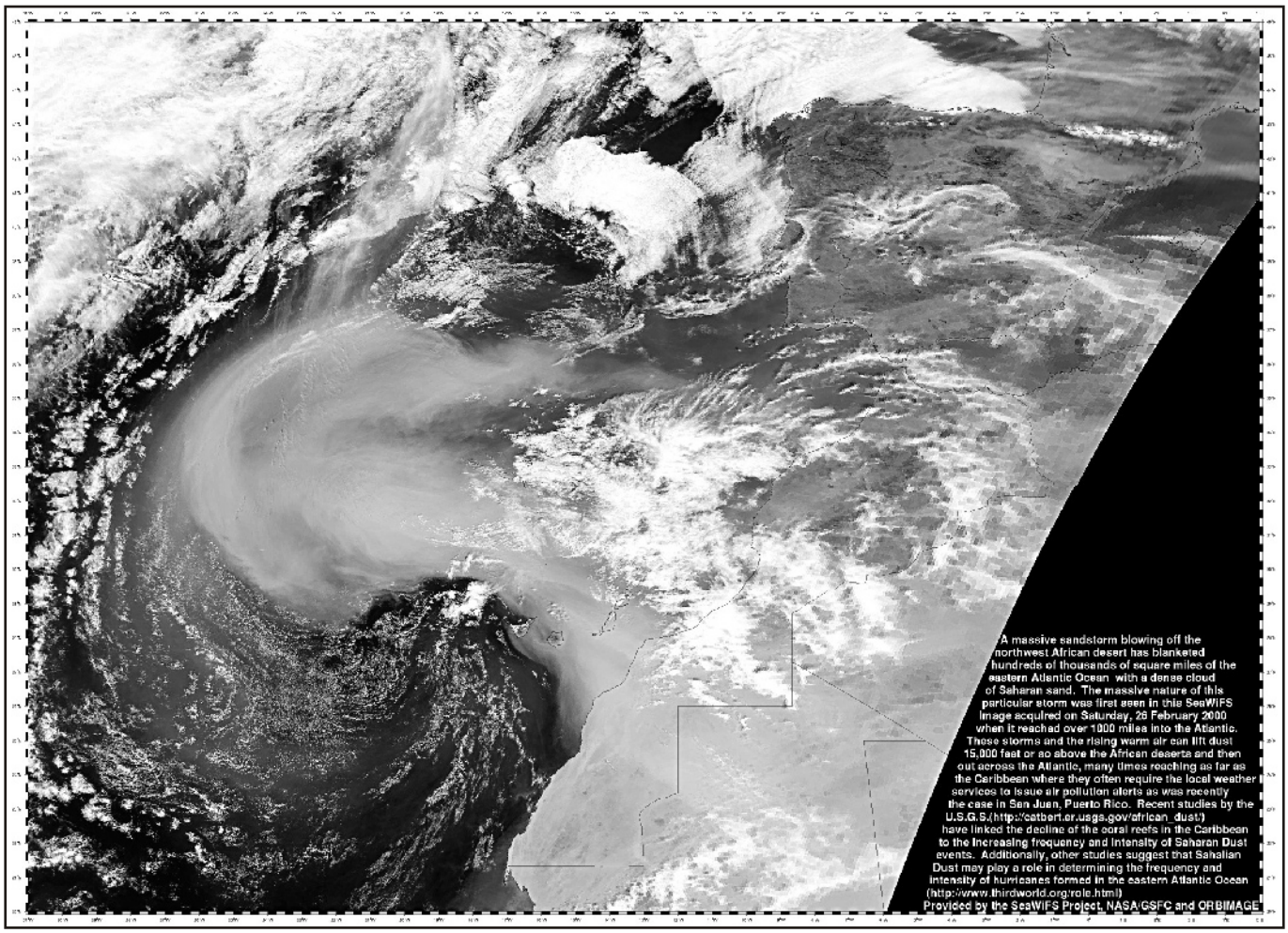

Figure 1. A massive sandstorm blowing off the northwestern African desert has blanketed hundreds of thousands of square miles of the eastern Atlantic Ocean with a dense cloud of Saharan sand. The massive nature of this particular storm was first seen in this SeaWiFS image acquired on Saturday, 26 February 2000, when it reached over 1000 miles into the Atlantic. These storms and the rising warm air can lift dust 15,000 feet or so above the African deserts and then out across the Atlantic, many times reaching as far as the Caribbean. Provided by the SeaWiFS Project, NASA/GSFC and ORBIMAGE. (Text modified from NOAA image).

spheres. Plant seeds along with potentially corresponding insect communities can appear overnight from a storm event thousands of miles away.

African dust storm events have recently become the focus of several investigations in an effort to determine their impact on the Western Hemisphere (Griffin, Kellogg, Garrison, and Shinn, 2002; Prospero, 2001; Swap, Ulanski, Cobbett, and Garstang, 1996). Unmanned satellite imagery (Chiapello, Prospero, Herman, and Hsu, 1999) as well as images obtained from the orbiting space shuttle (Apt, Helfert, and Wilkinson, 1996) reveals the tremendous volumes of sediment being transported across the Atlantic Ocean. This influx of dust across the Atlantic impacts both people and the environment, and it likely has done so since sometime following the Flood. This process yields interesting possibilities in understanding the spread of plants and insects in a post-Flood world.

African Dust Storms

African dust storms have likely occurred at two separate periods in Biblical history. The first was following the Flood, before the landmasses were covered in vegetation, and the second was in our Present-Age Timeframe (Froede, 1995; 1998) when the Saharan desert formed of sufficient size to yield considerable dust for separate storm events. However, only recently have scientists discovered the timing of these events, the soil/dust transport process, and its effect on our society in the Western Hemisphere.

Dust storms occur when strong fronts sweep across the region of sub-Saharan Africa lifting dust derived from topsoil along with other available organic matter. The magnitude of these events is dependent upon several factors, including; storm intensity, prevailing wind patterns, and the size of the desert across which the winds blow (Figures

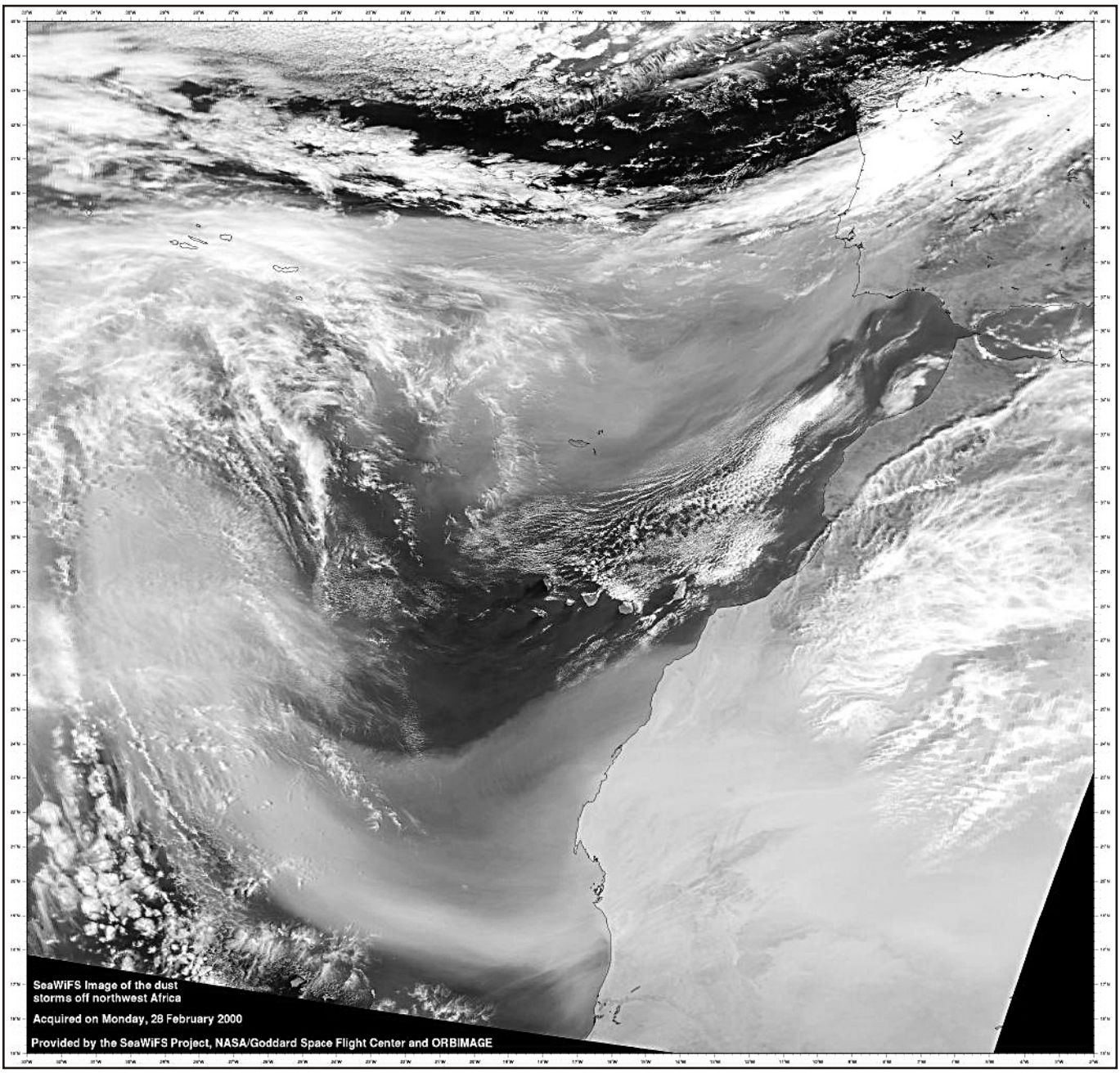

Figure 2. SeaWiFS Image of the dust storms off northwestern Africa. Acquired on Monday, 28 February 2000. Provided by the SeaWiFS Project, NASA/Goddard Space Flight Center and ORBIMAGE. (Text from NOAA image).

1, 2, and 3). With a large storm, both dust (Glaccum and Prospero, 1980; Perry, Cahill, Eldred, Dutcher, and Gill, 1997; Prospero, Bonatti, Schubert, and Carlson, 1979; Prospero and Nees, 1986; Rognon, Coudé-Gaussen, Revel, Grousset, and Pedemay, 1996) and insects (Ritchie and Pedgley, 1989; Rosenberg and Burt, 1999) can be lifted to great heights (up to 15,000 feet) and transported great distances.

Airborne dust studies on Barbados since 1965 have identified the African continent as a significant source of dust (Delany, Delany, Parkin, Griffin, Goldberg, Reimann, 1967; Prospero, 1968). Studies indicate that 25 to 37 million tons of dust are transported through the longitude of Barbados each year—a volume sufficient to maintain the present rate of pelagic sedimentation across the entire equatorial North Atlantic (Prospero and Carlson, 1972). Saharan dust is known to be deposited across portions of South America (Prospero, Glaccum, and Nees, 1981), and has been identified as an important soil component in the Amazon Basin (Swap, Garstang, Greco, Talbot, and KDllberg, 1992). Saharan dust has also been identified as the parent material for soils developed in the

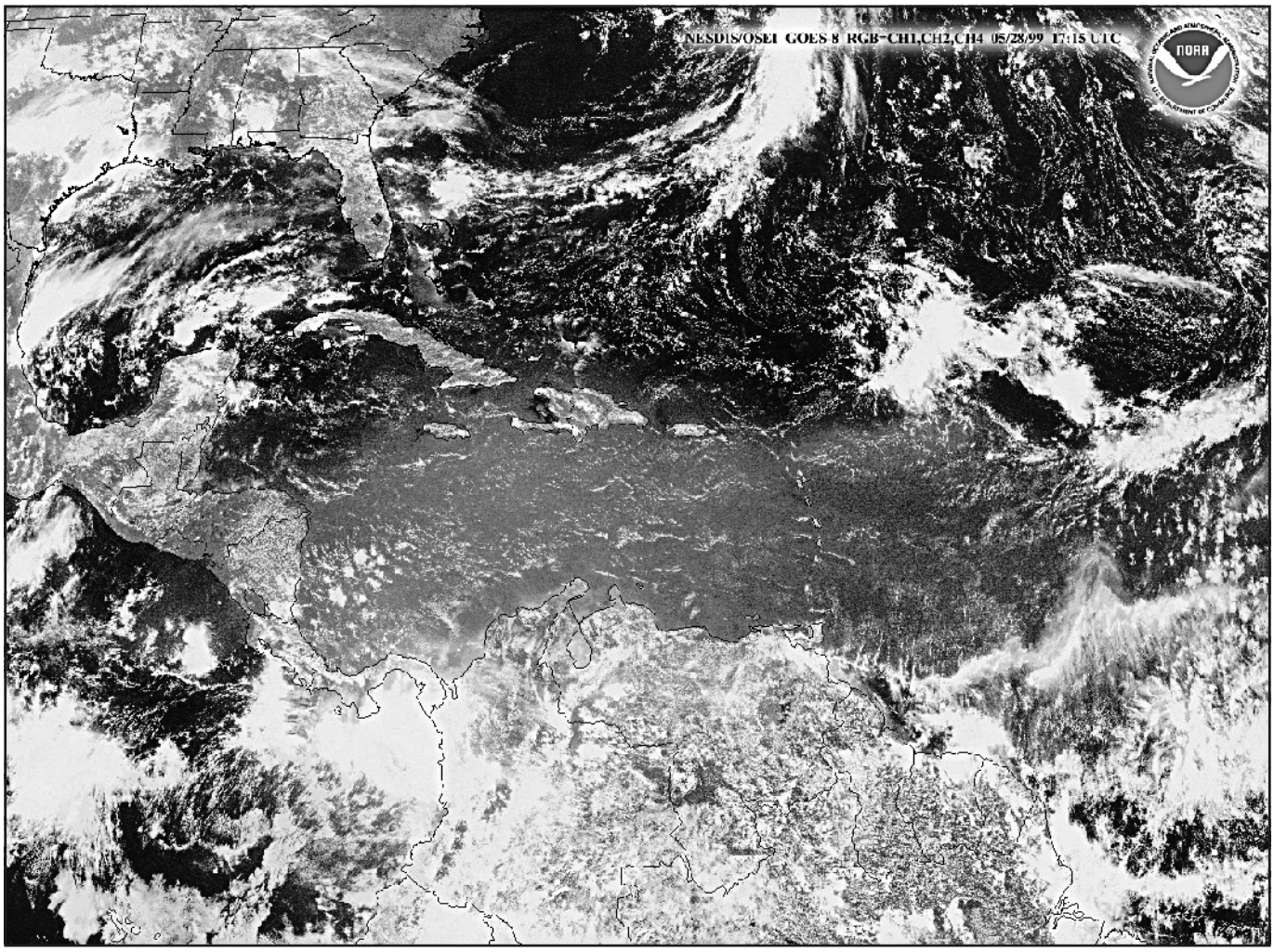

Figure 3. Airborne dust over the Caribbean Sea. This dust originated in the Sahara Desert of western Africa where it was lifted and carried off the coast by strong winds. (Text modified from NOAA image). NOAA GOES 8 satellite image dated May 28, 1999.

islands of the Caribbean and western Atlantic (Foos, 1991; Muhs, Crittenden, Rosholt, Bush, and Stewart, 1987; Muhs, Bush, Stewart, Rowland, and Crittenden, 1990).

Recent studies indicate that contaminants entrained within the African dust storms have caused coral reef die-off in the Caribbean Sea (Shinn, Smith, Prospero, Betzer, Hayes, Garrison, and Barber, 2000; Smith, Ives, Nagelkerken, Ritchie, 1996). The fungus *Aspergillas sydowii* derived from African dust is killing the coral reefs in both the Caribbean and the Florida Keys (Holmes, 2001) [Figure 4]. Pollution has also been identified in rather high concentrations within dust storms, but the pollutant levels are tied to the sources of the dust, so that the contamination levels vary for each dust storm (Griffin, Garrison, Herman, and Shinn, 2001; Griffin, Kellogg, and Shinn, 2001; Prospero, 1999).

The iron found within dust has been documented to stimulate diatom/plankton production where it falls on the open ocean (Duce and Tindale, 1991; Jickells, 1999). Other minerals in dust also appear to enhance the growth of microscopic marine life. Recent documentation has revealed a direct link between African dust storms and the outbreak of red tides (Appendix).

Clearly, tremendous energy is involved in lifting and transporting all of this material across the Atlantic Ocean during storm events. Presently, large dust outbreaks continue to come from the sub-Saharan desert on a seasonal basis.

Wind Transport in the Bible

The Bible (all scriptural references from Morris, 1995) is not mute when it comes to the issue of windborne transport of insects and other animals. The first reference of wind as an agent of animal displacement comes from Exodus, chapter 10:

> v. 13 And Moses stretched forth his rod over the land of Egypt, and the Lord brought an east wind upon

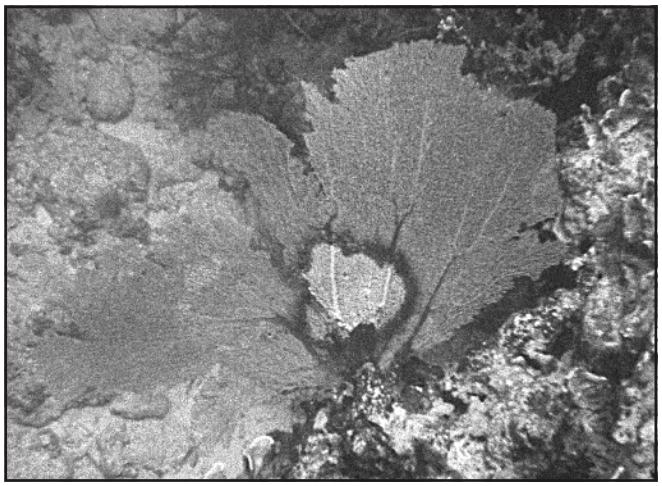

Figure 4. A sea fan dying from the fungus *Aspergillus sydowii* in the Florida Keys.

> the land all that day, and all that night; and when it was morning, the east wind brought the locusts.
>
> v. 19 And the Lord turned a mighty strong west wind, which took away the locusts, and cast them into the Red sea; there remained not one locust in all the coasts of Egypt.

Later, when the Jews were wandering in the wilderness, we read from the book of Numbers, chapter 11:

> v. 31 And there went forth a wind from the Lord, and brought quails from the sea, and let them fall by the camp...

Reference to windblown dust comes from Psalm 18:42:

> Then did I beat them small as the dust before the wind...

Possible Implications to the Post-Flood World

The post-Flood world must have been a barren place until plant life began to cover the ground surface. The spread of seed-bearing plants was likely rapid and not dependent on human migration. Today's African dust outbreaks provide us with a means of understanding how plants and insects could be spread around the world in a rapid manner. The physical translocation of other small creatures (e.g., birds) is also possible as a result of this type of storm event.

The islands of the Bahamas are many hundreds of miles from any continent. They are of rather recent origin, but contain an abundance of plant and insect communities. Even during the Ice Age, the islands were sufficiently isolated by deep water to prevent the formation of land bridges connecting them to continents. Obviously, the plants and animals are not native to the islands, rather transplants from other locations. Insect nest traces (Figure 5) are all that remain of what are thought to be digger wasps that inhabited the islands in a former time (Curran and White, 1987; Curran, 1997). Their origin is likely from the African continent, transported to San Salvador Island, Bahamas thousands of years ago. Plants indigenous to the African continent also occur on the island, but it is unclear how many can be attributed to man or trade winds.

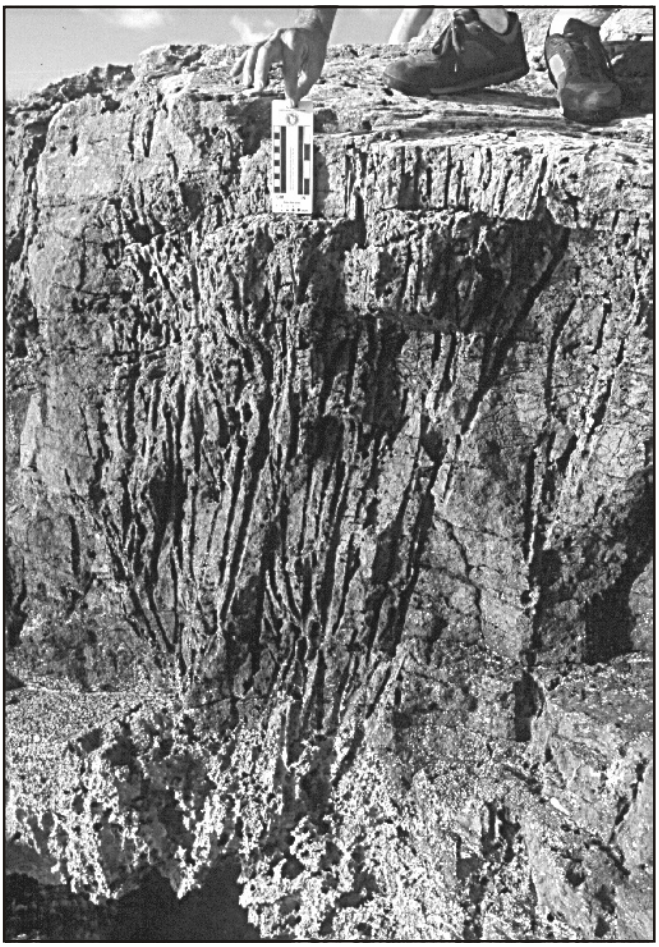

Figure 5. Digger wasp insect traces exposed on the shoreface of an Holocene eolianite on San Salvador Island, Bahamas. The outcrop faces the Atlantic Ocean. Scale in inches and centimeters.

The author has observed terra rossa soils ranging in composition from pink tinted carbonates to red clays (Figure 6), from San Salvador Island, Bahamas to the northern Florida Keys. While some scientists have speculated that the iron is derived from the weathering of the limestone (Isphording, Bundy, George, and Jackson, 1995), there remains little doubt that the majority of terra rossa soils identified in the Caribbean are derived from African dust.

Conclusion

Large-scale African dust storms provide the energy necessary to transport dust and organic materials for vast distances—even across the Atlantic Ocean. The Caribbean

islands have likely long been impacted by African dust storms. As a result, some of the plants and animals thought indigenous to the islands actually have ancestors on the African continent.

These massive African dust storms provide an excellent analogy to likely events in the Ice Age and lower Present Age Timeframes (Froede, 1995; 1998). Plants and animals would have been exposed to large-scale storms during this period of Earth history as climate changed following the Flood (Oard, 1990). Insects and seeds would have been scattered globally by winds. The end result would be a planet rapidly populated by plants and insects.

Appendix

Dr. E. A. Shinn has an excellent website that reviews the damage that African dust is having on the coral reefs in the Caribbean. I recommend that the interested reader review the information provided at: http://coastal.er.usgs. gov/african_dust/satellite.html. Information regarding microbial contamination associated with African dust can be found at the following NASA websites: http://science.nasa.gov/headlines/y2001/ast18jun_1.htm and http://www.gsfc.nasa.gov/gsfc/earth/toms/microbes.htm. African dust has recently been linked to red tide events in the Gulf of Mexico, for more information visit the following website: http://www.gsfc.nasa.gov/topstory/20010824redtides.html.

Acknowledgments

I thank the many donors to the Creation Research Society Research Fund, interest from which financed a portion of this study. I thank my wife Susan for allowing me the time and opportunity to research and write this article. I also thank Dr. Emmett Williams and Mr. Jerry Akridge for their helpful comments. Any mistakes are my own. Glory to God in the highest! (Prov. 3:5–6).

References

CRSQ: Creation Research Society Quarterly

Apt, J., M. Helfert, and J. Wilkinson. 1996. *Orbit: NASA astronauts photograph the Earth*. National Geographic Society. Washington, D.C.

Bowles, F. A. 1975. Paleoclimatic significance of quartz/illite variations in cores from the eastern equatorial North Atlantic. *Quaternary Research* 5:225–235.

Breed, C. S., and M. C. Reheis (Editors). 1999. *Desert winds: Monitoring wind-related surface processes in Arizona, New Mexico, and California*. U.S. Geological Survey Professional Paper 1598. Washington, D.C.

Figure 6. A paleosol layer attributed to African dust on Providence Island, Bahamas. The dust accumulated and was buried under migrating (now lithified) oolitic sands. The scale (in inches and centimeters) is at the paleosol level. Paleosol layers like this one have been found throughout the Bahamas and in some of the northern Florida Keys.

Brookfield, M. E., and T. S. Ahlbrandt (Editors). 1983. *Eolian sediments and processes*. Developments In Sedimentology No. 38. Elsevier, New York.

Chiapello, I., J. M. Prospero, J. R. Herman, and N. C. Hsu. 1999. Detection of mineral dust over the North Atlantic Ocean and Africa with the Nimbus 7 TOMS. *Journal of Geophysical Research* 104(D8):9277–9291.

Curran, H. A. (Editor), *Guide to Bahamian ichnology: Pleistocene, Holocene, and modern environments*. Bahamian Field Station, San Salvador, Bahamas.

Curran, H. A., and B. White. 1987. Trace fossils in carbonate upper beach rocks and eolianites: Recognition of the backshore to dune transition. In Curran, H. A. (Editor). *Proceedings, Third Symposium on the geology of the Bahamas*. pp. 243–254. CCFL Bahamian Field Station. San Salvador, Bahamas.

Delany, A, C., A. C. Delany, D. W. Parkin, J. J. Griffin, E. D. Goldberg, and B. E. F. Reimann. 1967. Airborne dust collected at Barbados. *Geochimica et Cosmochimica Acta* 31: 885–909.

Duce, R. A., and N. W. Tindale. 1991. Atmospheric transport of iron and its deposition in the ocean. *Limnology and Oceanography* 36(8):1715–1726.

Foos, A.M. 1991. Aluminous lateritic soils, Eleuthera, Bahamas: A modern analog to carbonate paleosols. *Journal of Sedimentary Petrology* 61:340–348.

Froede, C. R., Jr. 1995. A proposal for a creationist geological timescale. *CRSQ* 32:90–94.

———. 1998. *Field studies in catastrophic geology*. Creation Research Society Books. St. Joseph, MO.

Glaccum, R. A., and J. M. Prospero. 1980. Saharan aerosols over the tropical North Atlantic-Mineralogy. *Marine Geology* 37:295–321.

Greeley, R., and J. D. Iversen. 1985. *Wind as a geological process on Earth, Mars, Venus and Titan*. Cambridge Planetary Science Series No. 4. Cambridge University Press, New York.

Griffin, D. W., V. H. Garrison, J. R. Herman, and E. A. Shinn. 2001. African desert dust in the Caribbean atmosphere: Microbiology and public health. *Aerobiologia* 17:203–213.

Griffin, D. W., C. A. Kellogg, V. H. Garrison, and E. A. Shinn, 2002. The global transport of dust. *American Scientist* 90:228–235.

Griffin, D. W., C. A. Kellogg, and E. A. Shinn, 2001. Dust in the wind: Long range transport of dust in the atmosphere and its implications for global public and ecosystem health. *Global Change and Human Health* 2(1): 20–33.

Holmes, H. 2001. *The secret life of dust: From the cosmos to the kitchen counter, the big consequences of little things*. Wiley, New York.

Isphording, W. C., M. E. Bundy, S. M. George, and R. B. Jackson. 1995. Depositional interpretation of limestone insoluble residues from modern and ancient carbonate rocks, Caribbean and southern United States. *Gulf Coast Association of Geological Societies Transactions* 45:285–291.

Jickells, T. D. 1999. The inputs of dust derived elements to the Sargasso Sea; A synthesis. *Marine Chemistry* 68:5–14.

Kolla, V., P. E. Biscaye, and A. F. Hanley. 1979. Distribution of quartz in late Quaternary Atlantic sediments in relation to climate. *Quaternary Research* 11:261–277.

Morales, C. (Editor). 1979. *Saharan dust*. Wiley, New York.

Morris, H. M. 1995. *The defender's study Bible*. World Publishing, Grand Rapids, MI.

Muhs, D. R., C. A. Bush, K. C. Stewart, T. R. Rowland, and R. C. Crittenden. 1990. Geochemical evidence of Saharan dust parent material for soils developed on Quaternary limestones of Caribbean and western Atlantic islands. *Quaternary Research* 33:157–177.

Muhs, D. R., R. C. Crittenden, J. N. Rosholt, C. A. Bush, and K. C. Stewart. 1987. Genesis of marine terrace soils, Barbados, West Indies: Evidence from mineralogy and geochemistry. *Earth Surface Processes and Landforms* 12:605–618.

Oard, M. J. 1990. *An ice age caused by the Genesis Flood*. Institute for Creation Research, San Diego, CA.

Parmenter, C., and D. W. Folger. 1974. Eolian biogenic detritus in deep sea sediments: A possible index of equatorial ice age aridity. *Science* 185:695–698.

Perry, K. D., T. A. Cahill, R. A. Eldred, D. D. Dutcher, and T. E. Gill. 1997. Long-range transport of North African dust to the eastern United States. *Journal of Geophysical Research* 102(D10):11,225–11,238.

Péwé, T. L. (Editor). 1981. *Desert dust: Origin, characteristics, and effect on man*. Special Paper No. 186. Geological Society of America, Boulder, CO.

Pokras, E. M., and A. C. Mix. 1985. Eolian evidence for spatial variability of late Quaternary climates in tropical Africa. *Quaternary Research* 24:137–149.

Prospero, J. M. 1968. Atmospheric dust studies on Barbados. *American Meteorological Society Bulletin* 49:645–652.

———. 1999. Long-term measurements of the transport of African mineral dust to the southeastern United States: Implications for regional air quality. *Journal of Geophysical Research* 104(D13):15,917–15,927.

———. 2001. African dust in America. *Geotimes* 46(11): 24–27.

Prospero, J. M. and T. N. Carlson. 1972. Vertical and areal distribution of Saharan dust over the western equatorial North Atlantic Ocean. *Journal of Geophysical Research* 77(27):5255–5265.

Prospero, J. M., and R. T. Nees. 1977. Dust concentration in the atmosphere of the equatorial North Atlantic: Possible relationship to the Sahelian drought. *Science* 196: 1196-1198.

———. 1986. Impact of the North African drought and El NiZo on mineral dust in the Barbados trade winds. *Nature* 320:735–738.

Prospero, J. M., E. Bonatti, C. Schubert, and T. N. Carlson. 1979. Dust in the atmosphere traced to an African dust storm. *Earth and Planetary Science Letters* 9:287–293.

Prospero, J . M., R. A. Glaccum, and R. T. Nees. 1981. Atmospheric transport of soil dust from Africa to South America. *Nature* 289:570–572.

Pye, K. 1987. *Aeolian dust and dust deposits*. Academic Press, New York.

Pye, K. (Editor). 1993. *The dynamics and environmental context of aeolian sedimentary systems*. Geological Soci-

ety Special Publication No. 72. Geological Society of London. Geological Society Publishing House, Bath, UK.

Ritchie, M., and D. Pedgley. 1989. Desert locusts cross the Atlantic. *Antenna* 13:10–12.

Rognon, P., G. Coudé-Gaussen, M. Revel, F. E. Grousset, and P. Pedemay. 1996. Holocene Saharan dust deposition on the Cape Verde Islands: Sedimentological and Nd-Sr isotopic evidence. *Sedimentology* 43:359–366.

Rosenberg, J., and P. J. A. Burt. 1999. Windborne displacements of desert locusts from Africa to the Caribbean and South America. *Aerobiologia* 15:167–175.

Shinn, E. A., G. W. Smith, J. M. Prospero, P. Betzer, M. L. Hayes, V. Garrison, and R. T. Barber. 2000. African dust and the demise of Caribbean coral reefs. *Geophysical Research Letters* 27(19):3029–3032.

Smith, G. W., L. D. Ives, I. A. Nagelkerken, and K. B. Ritchie. 1996. Caribbean sea-fan mortalities. *Nature* 383:487.

Swap, R., M. Garstang, S. Greco, R. Talbot, and P. KDllberg. 1992. Saharan dust in the Amazon Basin. *Tellus* 44B:133–149.

Swap, R., S. Ulanski, M. Cobbett, and M. Garstang. 1996. Temporal and spatial characteristics of Saharan dust outbreaks. *Journal of Geophysical Research* 101(D2): 4205–4220.

Book Review

Tracks in the Sea by Chester G. Hearn
McGraw-Hill, New York. 2002, 278 pages, $25.

This is the story of Matthew Fontaine Maury who first mapped the world's ocean currents. Maury (1806-1873) was raised in Virginia and joined the U.S. Navy in 1825. For fifteen years he sailed the seas and reached lieutenant rank. On October 17, 1839, however, Mary's life changed suddenly. His femur was shattered in a stagecoach accident near Somerset, Ohio. The injury eventually healed but Maury's seafaring days were over. A godly man, Mary prayed "for the understanding and the grace to accept his fate" (p. 81).

The accident began a new career direction for Maury which eventually saved countless thousands of lives. He was troubled by news of ships which became lost, suffered long delays because of contrary winds and currents, and which collided with rocks, reefs, or other craft. Maury suspected that there were predictable ocean currents which could provide maps and safe travel lanes. In the first oceanography textbook ever written, *Physical Geography of the Sea* (1855), author Maury attributed his insights to Psalm 8:6-8, "Thou madest him to have dominion over the works of thy hands… and whatsoever passes through the paths of the seas." Chester Hearn, author of the book under review, apparently does not grasp the Christian worldview of Maury. Maury's childhood is described as an endless and dreary routine of Bible memorization (p. 27). For a more positive, excellent overview of Maury's spiritual life, see Meyer (1982).

Maury gathered worldwide ocean current data by analyzing over one million readings (p. 194). He then drew detailed maps which were of immediate use to sailors. Several of the maps are included in this book, and the maps are still widely used today. Maury soon became a leading national figure. In 1840 he first suggested startup of the U.S. Naval academy in Annapolis, Maryland. Maury declined nomination for Secretary of the Navy, and instead he became the first Superintendent of the Naval Observatory in 1844. His research work expanded to include charts for weather, islands, shoals, the Gulf Stream (p. 104), and observations of sea creatures.

Maury's sea charts gave the fastest course to follow for each month of the year for various destinations. For example, Maury's suggested ocean route from Boston to Rio Janeiro reduced travel time by half, from 72 days to 35 days. Next Maury charted the Atlantic Ocean depths to aid in the laying of communication cables between the U.S. and Europe. As the U.S. Civil War approached, Maury sided with the confederates. He resigned from the Naval Observatory and helped the South develop several warships. After the war Maury fled the country for a time with a price on his head, becoming a citizen of Mexico. Eventually Maury was welcomed back to the U.S. where he helped begin the National Weather Service (p. 242). His final years were spent at the Virginia Military Institute. Mary's life was highly productive and carried a Christian testimony from start to finish. He is an outstanding example of a Christian creationist scientist.

Reference

Meyer, John. 1982. The Life and Philosophy of Matthew Fontaine Maury, Pathfinder of the Sea. *CRSQ* 19(2): 91-100.

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