Sensationalism and the short memory of science journalism

Doron Nof and Nathan Paldor

Several people, among them a few journalists, have contacted us recently asking in what sense is the recent work of Drews and Han (published in PLoSONE) on the parting of the Red-Sea any different than what we published in the Bulletin of the American Meteorological Society (BAMS) in 1992.

As discussed below, it turns out that there is hardly any scientific difference at all aside from

(i) the point that they used a numerical model whereas we derived a (more reliable) analytical solution, and
(ii) their difference in the location and wind direction.

The dynamics are exactly the same and so are the physical processes in question. The real difference between the two, and the reason for the broad attention that the Drews and Han paper received, is merely the fact that our work was published eighteen years ago. Some people, including science journalists, who should really know better, simply tend to forget or do not bother to check for details. One would hope that the media office of an organization like NCAR would have done better.

In what follows immediately below we address this issue in detail. In 1992, Nof and Paldor presented the first nonlinear analytical calculations addressing the parting of the Red-Sea. Using a steady model, they showed that strong winds acting on bodies of water as long and as shallow as the Gulf of Suez can cause a depression in the sea-level of 5 meters or more, exposing any underwater ridges that are shallower than that. Theoretically, such conditions may lead to the creation of a "land bridge" on which a limited number of people can cross from one side to the other. The ridge is again submerged when the wind subside. Nof and Paldor then imagined that some of the Israeli elders have seen this natural phenomenon, which then provided the origin for the biblical Red-Sea crossing story. Taking the bible as an assembly of stories transmitted from generation to generation with variations and distortions introduced in between, we were not concerned with a detailed matching of the theory to the biblical account, which we considered inaccurate anyway. The reader is referred to http://doronnof.net/red-sea.php for details.

Our work was later followed by the elegant mathematical analysis of Voltzinger and Androsov who derived an analytical solution for the time dependent problem showing the periods that the ridge can be exposed and/or submerged. Perhaps naively, Russian journalists writing in Pravda erroneously presented their work as the first scientific work on the subject.

Taking a more religious approach and attempting to duplicate the bible more accurately, Drews and Han tried to match the wind direction more closely, an issue that we considered marginal and insignificant. Nevertheless, we respect their choice to look at that aspect. Furthermore, we have no issue at all with Drews and Han because authors are not responsible for the manipulation that the media introduces to their work. Our point is that most of the contributions erroneously assigned to them by the NCAR media office were made much earlier in Nof and Paldor (1992).

To illustrate the above point more clearly, we marked the fifteen (15) points made by the NCAR press release on the original release, which is reproduced in the Appendix below. The most important point is point 15, which was also clearly made by us. Disturbingly, points 1, 3, 5, 7, 8, 12 and 13—more than half the points made in the NCAR press release— could and have been made about our earlier work.

In summary, it seems that, in their desire to sensationalize, the NCAR media office has re-invented the Parting of the Red-Sea in much the same way as one would re-invent the wheel. There are serious scientific issues with Drews and Han work too (e.g., the unacceptably small likelihood of 100 km/h winds according to the Weibull statistics, the conventional sea-level rise understanding of 1 millimeter per year suggesting that the areas that the authors are addressing were dry to begin with) but these are not the focus of this piece.

Appendix:

From: UCAR/NCAR Press Office <media@ucar.edu>
Date: September 21, 2010 11:38:24 AM EDT
To: local-pr@ucar.edu, press-release@ucar.edu
Subject: Physics of Red Sea escape route simulated on computers.

2010-24 FOR IMMEDIATE RELEASE: September 21, 2010

Parting the waters:
Computer modeling applies physics to Red Sea escape route

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Note to editors and producers:

Visuals available:
- broadcast-quality scientific animation
- broadcast-quality video of Carl Drews discussing this study
- high-resolution illustration
https://www2.ucar.edu/news/parting-waters-computer-modeling-applies-physics-red-sea-escape-route

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BOULDER--The biblical account of the parting of the Red Sea has inspired and mystified people for millennia. A new computer modeling study by researchers at the National Center for Atmospheric Research (NCAR) and the University of Colorado at Boulder (CU) shows how the movement of wind as described in the book of Exodus could have parted the waters.

1) The computer simulations show that a strong east wind, blowing overnight, could have pushed water back at a bend where an ancient river is believed to have merged with a coastal lagoon along the Mediterranean Sea. With the water pushed back into both waterways, a land bridge would have opened at the bend, enabling people to walk across exposed mud flats to safety. As soon as the wind died down, the waters would have rushed back in.

2) The study is intended to present a possible scenario of events that are said to have taken place more than 3,000 years ago, although experts are uncertain whether they actually occurred. The research was based on a reconstruction of the likely locations and depths of Nile delta waterways, which have shifted considerably over time.

3) “The simulations match fairly closely with the account in Exodus”, says Carl Drews of NCAR, the lead author. “The parting of the waters can be understood through fluid dynamics. The wind moves the water in a way that’s in accordance with physical laws, creating a safe passage with
water on two sides and then abruptly allowing the water to rush back in”.

4) The study is part of a larger research project by Drews into the impacts of winds on water depths, including the extent to which Pacific Ocean typhoons can drive storm surges. By pinpointing a possible site south of the Mediterranean Sea for the crossing, the study also could be of benefit to experts seeking to research whether such an event ever took place. Archeologists and Egyptologists have found little direct evidence to substantiate many of the events described in Exodus.

The work, published in the online journal, PLoS ONE, arose out of Drews’ master’s thesis in atmospheric and oceanic sciences at CU. The computing time and other resources were supported by the National Science Foundation.

-----Wind on the water -----

5) The Exodus account describes Moses and the fleeing Israelites trapped between the Pharaoh\'s advancing chariots and a body of water that has been variously translated as the Red Sea or the Sea of Reeds. In a divine miracle, the account continues, a mighty east wind blows all
night, splitting the waters and leaving a passage of dry land with walls of water on both sides. The Israelites are able to flee to the other shore. But when the Pharaoh\'s army attempts to pursue them in the morning, the waters rush back and drown the soldiers.

6) Scientists from time to time have tried to study whether the parting of the waters, one of the famous miracles in the Bible, can also be understood through natural processes. Some have speculated about a tsunami, which would have caused waters to retreat and

advance rapidly. But such an event would not have caused the gradual overnight divide of the waters as described in the Bible, nor would it necessarily have been associated with winds.

7) Other researchers have focused on a phenomenon known as “wind setdown”, in which a particularly strong and persistent wind can lower water levels in one area while piling up water downwind. Wind setdowns, which are the opposite of storm surges, have been widely documented, including an event in the Nile delta in the 19th century when a powerful wind pushed away about five feet of water and exposed dry land.

8) A previous computer modeling study into the Red Sea crossing by a pair of Russian researchers, Naum Voltzinger and Alexei Androsov, found that winds blowing from the northwest at minimal hurricane force (74 miles per hour) could, in theory, have exposed an underwater reef near the
modern-day Suez Canal. This would have enabled people to walk across. The Russian study built on earlier work by oceanographers Doron Nof of Florida State University and Nathan Paldor of Hebrew University of Jerusalem that looked at the possible role of wind setdown.

9) The new study, by Drews and CU oceanographer Weiqing Han, found that a reef would have had to be entirely flat for the water to drain off in 12 hours. A more realistic reef with lower and deeper sections would have retained channels that would have been difficult to wade through. In addition, Drews and Han were skeptical that refugees could have crossed during nearly hurricane-force winds.

-----Reconstructing ancient topography-----

10) Studying maps of the ancient topography of the Nile delta, the researchers found an alternative site for the crossing about 75 miles north of the Suez reef and just south of the Mediterranean Sea. Although there are uncertainties about the waterways of the time, some oceanographers believe that an ancient branch of the Nile River flowed into a coastal lagoon then known as the Lake of Tanis. The two waterways would have come together to form a U-shaped curve.

11) An extensive analysis of archeological records, satellite measurements, and current-day maps enabled the research team to estimate the water flow and depth that may have existed 3,000 years ago. Drews and Han then used a specialized ocean computer model to simulate the impact of an overnight wind at that site.

12) They found that a wind of 63 miles an hour, lasting for 12 hours, would have pushed back waters estimated to be six feet deep. This would have exposed mud flats for four hours, creating a dry passage about 2 to 2.5 miles long and 3 miles wide. The water would be pushed back into both the lake and the channel of the river, creating barriers of water on both sides of newly exposed mud flats.

13) As soon as the winds stopped, the waters would come rushing back, much like a tidal bore. Anyone still on the mud flats would be at risk of drowning.

14) The set of 14 computer model simulations also showed that dry land could have been exposed in two nearby sites during a windstorm from the east. However, those sites contained only a single body of water and the wind would have pushed the water to one side rather than creating a dry passage through two areas of water.

15) “People have always been fascinated by this Exodus story, wondering if it comes from historical facts”, Drews says. “What this study shows is that the description of the waters parting indeed has a basis in physical laws”.

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