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Flood Basins Created by Ephemeral Rivers of Namibia in the Satellite Image Time Series of Google Earth

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Abstract: Here we show that, in the satellite image time series of Google Earth, it is possible to observe how some ephemeral rivers of Namibia can be dammed by the dunes of the Skeleton Coast, creating some flood reservoir basins.

Keywords: Satellite Image Time Series, Google Earth, Water Reservoirs, Environment.

Google Earth is a virtual planet which is showing its life through the time series of satellite images (SITS). These SITS can be a quite interesting tool for studying the development of anthropized areas such as the evolution of natural environments. In some previous papers for instance, we have investigated using the Google Earth SITS the motion of sand dunes [1-3] and the decreasing level of Dead Sea [4]. Here we will show some SITS of ephemeral rivers of Namibia, which are occasionally flowing towards the Atlantic Ocean, crossing the Skeleton Coast [5-12]. Using Google Earth, it is possible to observe how the ephemeral rivers can be dammed by the dunes of the Skeleton Coast, creating some flood reservoir basins.

The Skeleton Coast is characterized by a wide dune belt, 6–22 km wide [5]. As observed in [5], this dune belt dams the W-SW flowing ephemeral rivers on their route towards the ocean. Of these rivers, the southern Koigab, Uniab and Hunkab, are characterized by infrequent ephemeral flows, whereas the northern Hoanib and Hoarusib, are fed by large catchment areas. In this manner, these rivers are characterized by higher discharge and more frequent flows, because they are influenced by the intertropical convergence zone having more monsoonal rainfalls [5]. In the Figure 1, a Google Earth map is used to show the rivers (note that the map is rotated).



Figure 1: Maps of rivers in Namibia, Skeleton Coast.

It is necessary to tell that the river damming due to sand dunes is different according to latitude. The dune belt increases in width and height and changes from the low barchanoid dunes in the south to the large transverse dunes in the north. Since the morphology of the dune field is

changing, it happens as a consequence that the northern rivers are effectively dammed at the eastern margin of the erg, causing flood reservoir basins there [5]. In contrast, southern rivers are dammed within the erg, because the most pronounced and commonly encountered barrier is given by the dunes at its western border [5].

In the abovementioned paper [5], Landsat images were used. Here, let us see what can be observed on Google Earth. In the Figure 2, for instance, we have a river which is able of opening its route to the ocean among the dunes. It is the Uniab River. The original Google Earth image was adjusted by GIMP.

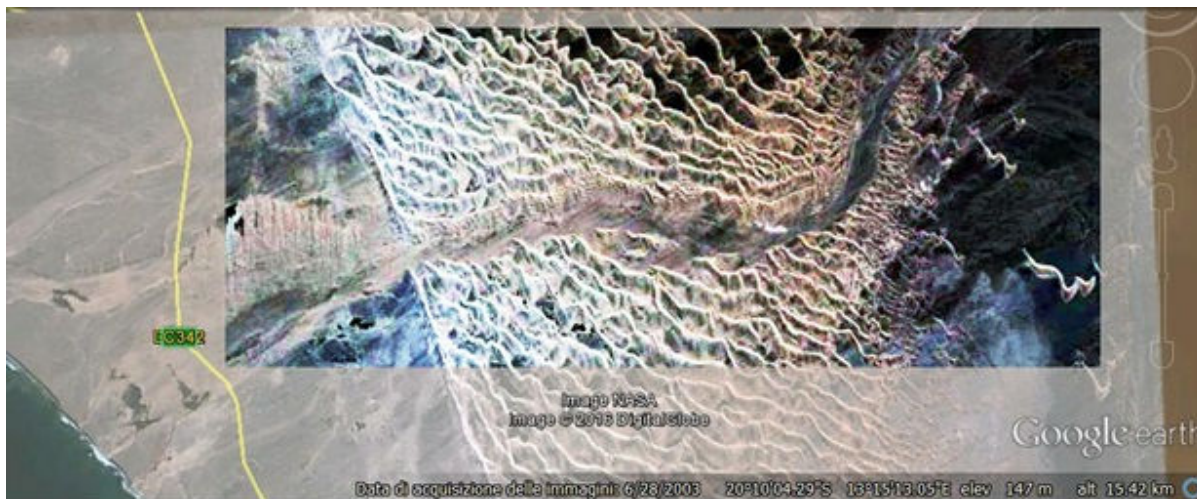


Figure 2: Uniab ephemeral river among the dunes.

However, we have the possibility to observe, for a northern river, where we find large transverse dunes, the damming of rivers. In the Figure 3, we can see the Hunkab ephemeral river, in images dated 3/2011 and 5/2012. This river is dammed by the dunes. In the left panel we can see a flood reservoir.



Figure 3: Hunkab ephemeral river dammed by the dunes, as shown by Google Earth SITS. Note the flood reservoir basin in the left panel. It is also shown in the following Figure 4.

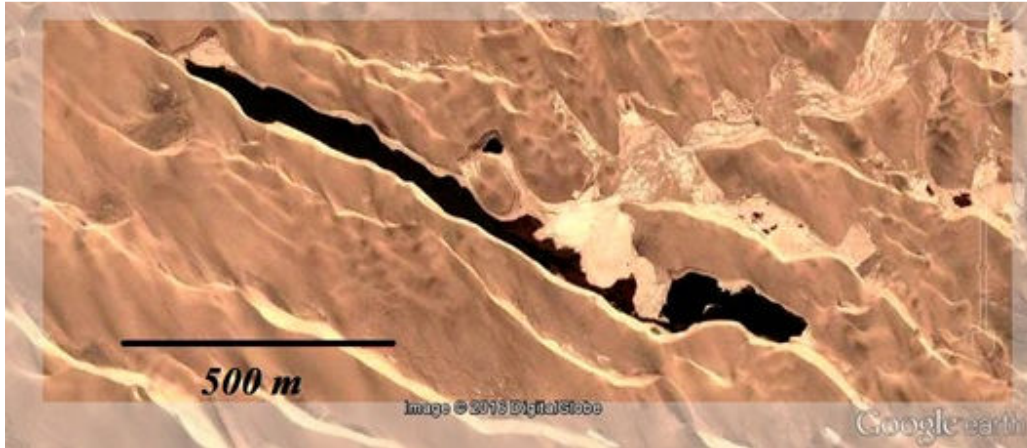


Figure 4: Flood reservoir basin Hunkab river.

As we can see from the Figure 4, the reservoir is stretching itself parallel to the dunes, more than one kilometre long. Another example of reservoir is shown in the Figure 5. In fact, Google Earth SITS of this region is containing a limited number of images, therefore the satellite images given in Figures 3-5 are probably not coincident to the maximum of flood. However, to roughly estimate the effect of the flood, we could study the perturbation of the sand dunes about the reservoirs and the patterns which had been created by flowing water. In this manner, it could be possible to estimate how large was the area involved in flooding. Let us conclude, remarking that a large research work is and was made on these rivers. It is important, because flowing ephemeral rivers and their catchments are water resources for people living in this region who is currently using them [10].

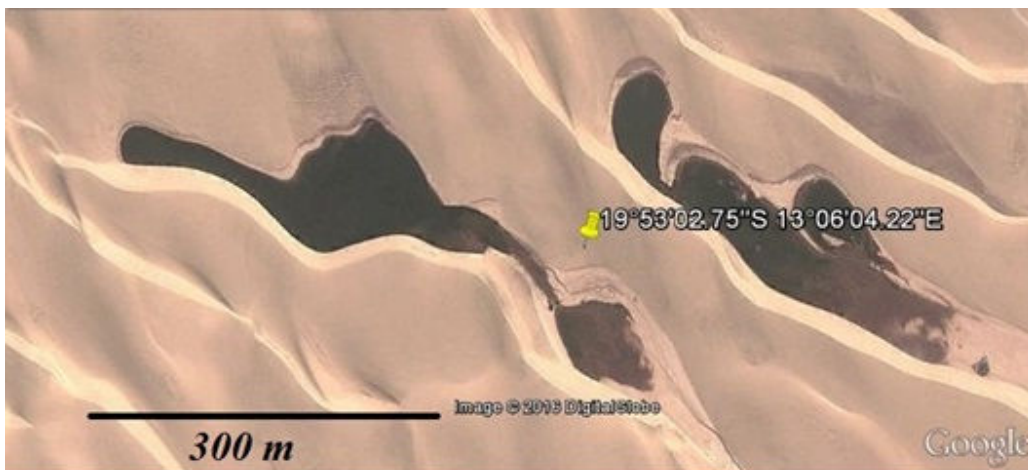


Figure 5: Flood reservoir basin of Hunkab ephemeral river in Google Earth Namibia.

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