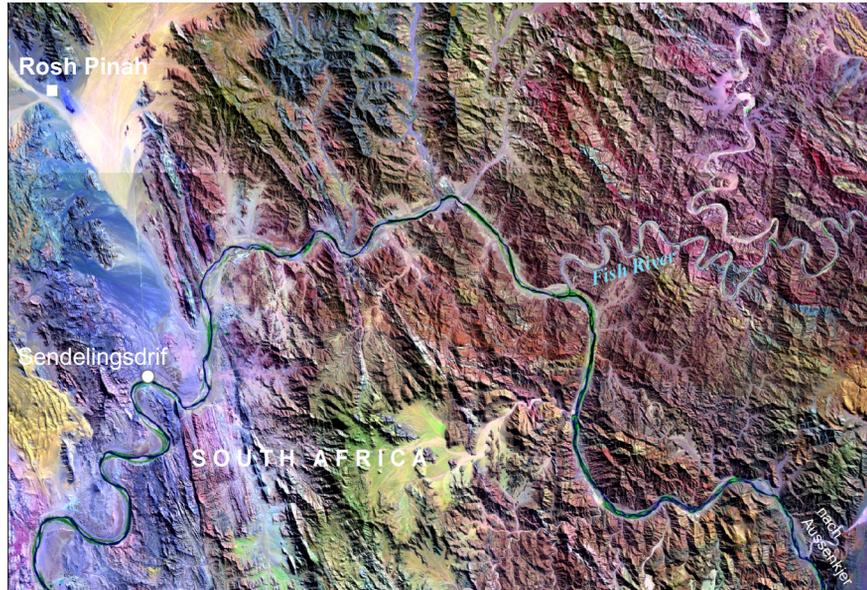


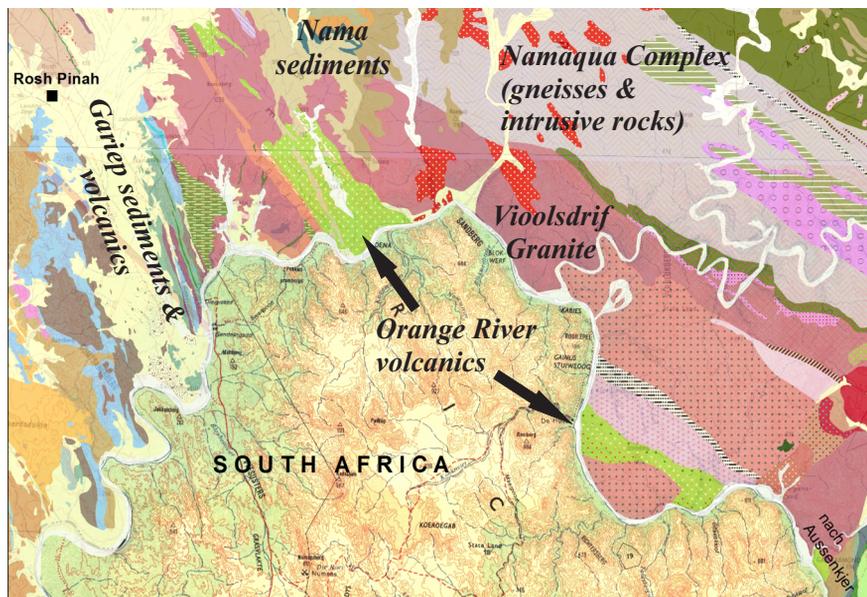
THE ORANGE



Although the Orange River rises only 200 km from the Indian Ocean in the Lesotho Drakensberg (ca. 3300 m a.s.l.), it turns west to traverse the southern African subcontinent for nearly 2200 km before entering the Atlantic Ocean at Oranjemund in a wide delta. The lower Orange forms the national border between South Africa and Namibia, and the stretch between the border town of Noordoewer and the coast is one of the most picturesque in either country, passing through awe-inspiring mountainscapes and impressive sand dunes. Downstream from Sendelingsdrif the dirt road transects the restricted area of the Sperrgebiet (Diamond Area) to enter which a special permit is required.



Satellite image (above) and geological map (below) of the Orange River between Sendelingsdrif and Aussenkjer



East of Sendelingsdrif (upstream) the Orange transects 2000 to 1700 million year old volcanic rocks and granites, which represent the earliest continental crust preserved in this region. The Orange River lavas originated in the upper Earth mantle, and upon extrusion formed volcanic islands over a subduction zone, where one lithospheric plate was “pushed” under another, creating friction and high pressures. A modern-day example for such a scenario is the Aleutian archipelago off the Alaskan coast. Near Aussenkjer the road following the northern bank of the Orange emerges from the wild mountains of the deep past into the Karasburg Karoo-Basin, which is characterized by flat-lying mud- and siltstones, with minor sandstones and limestones, of the Permian period - a time gap of some 1400 million years.

At the end of the Cretaceous period, some ca. 65 million years ago, the Orange already was an important drainage system in southern Africa that transported an enormous sediment load downstream, the bulk of which was deposited in a wide undersea delta off Oranjemund. From here longshore currents, assisted by strong southwesterly winds, moved the sand north along the Namibian coast, where it formed the “Namib Sand Sea”, which since 2013 enjoys World Heritage status. From this process, which still continues today, the Orange got its nickname „Father of the Namib“.



Downstream of Sendelingsdrif the Orange traverses the 770 - 540 million year old Gariep Belt - an ancient mountain range which formed around the same time as the Damara Orogen of northern and central Namibia. But although both massifs are part of the greater “Pan-African Orogeny” and consist of similar rock types such as schist, quartzite, diamictite and carbonate rock, each has distinctive characteristics. While the entire Gariep succession is only about 1000 m thick, the Damara rocks locally reach more than 10 000 m. Also the Gariep Belt lacks the high-grade metamorphic gneisses and ubiquitous and compositionally diverse granitic rocks of the Damara Orogen.



The Orange between South Africa and Namibia