

CEDIM Forensic Disaster Analysis Group (FDA)
Torrential Rain & Flooding in South Africa (April 2022)

17 April 2022 – Report No. 1

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OVERVIEW

Event	Start	End	Duration
Heavy Rain	04/11/2022	04/13/2022	2 – 3 Days

Herausragende Ereignisse:

Flooding, Landslides	e.g. Durban, Province KwaZulu-Natal
Heavy Rain	304 mm Virginia Airport (Durban north)
Heavy Rain	locally > 400 % (Mean Precipitation April)
Severe Damage	>13.000 Buildings damaged, 4000 destroyed
Fatalities	At least 395

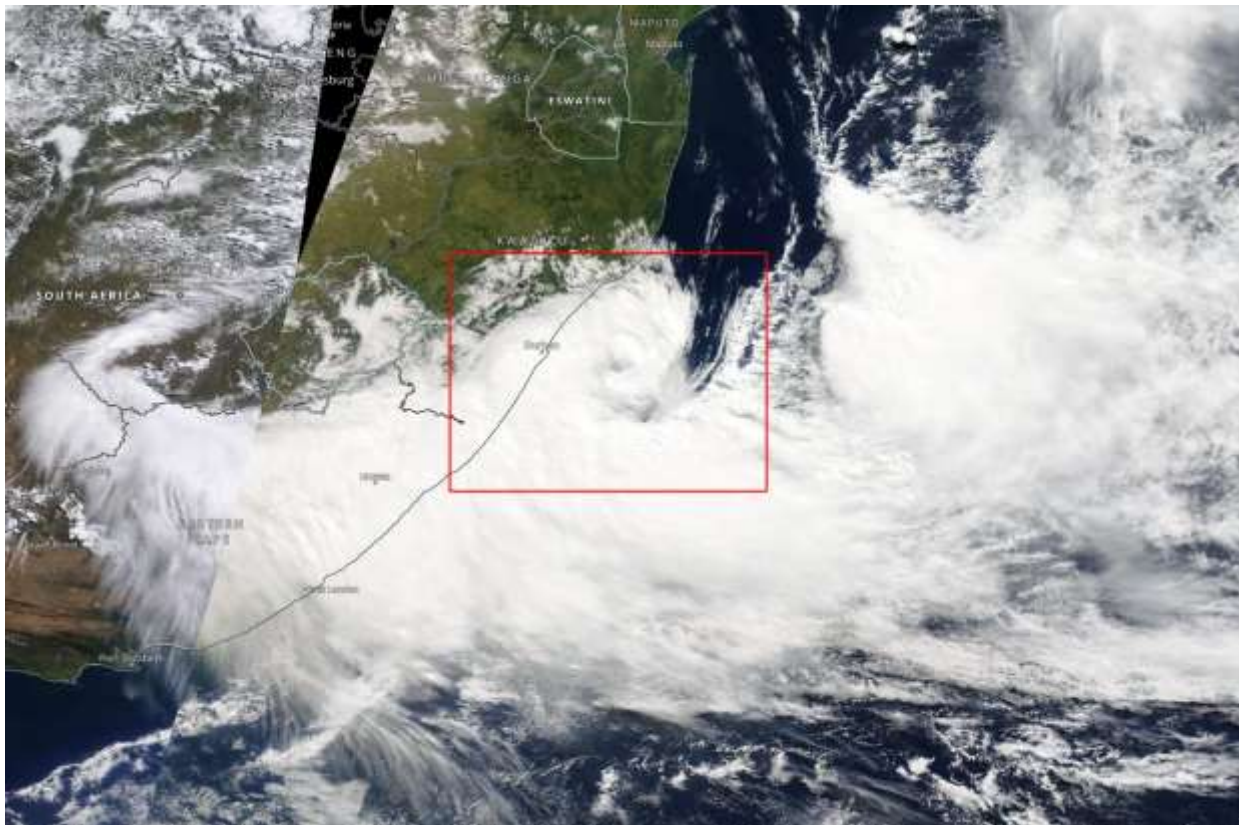


Figure 1: Satellite Images on 12 April 2022 (Source: <https://worldview.earthdata.nasa.gov>).

1. Summary

Around three months ago, in January 2022, parts of South Africa were already the scene of repeated and in some cases extreme rainfall that led to major flooding and claimed several lives. The Eastern Cape and KwaZulu-Natal provinces in particular suffered major damage. And this time, at the beginning of the second decade of April, coastal areas of the KwaZulu-Natal province again received enormous amounts of rain at the. Within two days, some stations recorded rainfall totals of around 450 mm, and in some places around 300 mm within 24 hours. In view of such rainfall, the numerous landslides, destroyed bridges and roads, and thousands

of damaged or demolished buildings come as no surprise. At least 395 people lost their lives. Partly responsible for the devastating rains was the subtropical depression "Issa," which - quite surprisingly - had formed just off the coast of KwaZulu-Natal. With nearly 400 deaths, "Issa" and a persistent upper-level trough to the west became the deadliest storm event in South Africa's history.

2. Meteorological Information

2.1. The Subtropical Storm „Issa“ and associated rain amounts

The precipitation was partly due to the subtropical low "Issa", which formed just off the southeast coast of South Africa in the afternoon of 11 April 2022 (UTC) and was named on 12 April 2022, 12 UTC. There were no clear signs of its formation beforehand. Issa did not have the tropical characteristics of a typhoon or hurricane, but Meteo-France Reunion analyzed 10-minute-average winds of 95 km/h, with some gusts of 130 km/h reaching hurricane-force. On the evening of April 12, 2022, 18 UTC, the pressure was 994 hPa and "Issa" was slowly moving southeastward at a speed of 13 km/h. The Joint Typhoon Warning Center's Automated Tropical Cyclone Forecasting System (ATCF) gave 1-minute average winds of 75 km/h and a pressure of 993 hPa.

The precursor of "Issa" formed as a surface low just off the coast near the South Africa/Mozambique border. The depression owed its formation on 11 April 2022 to a persistent upper-level trough that lay over the eastern parts of South Africa and over Lesotho where it induced a low-level convergence. With water temperatures of 25 to 26 °C, conditions were not ideal, but a weak vertical wind shear allowed the surface low to intensify further. Satellite imagery even suggested an eye-like structure in the evening. The lifetime of the subtropical cyclone can be estimated at about 60 hours.

The upper-level trough and "Issa" were responsible for enormous amounts of rain over the southeastern part of South Africa and Lesotho. The largest amounts of rain fell in the province of KwaZulu-Natal near the coast, where measurements showed rain totals of up to 600 mm within 5 days. On April 11-12, 2022 alone, 310 mm fell within 24 hours near Port Edward and Durban. Figure 3 illustrates rainfall totals for the 7-day period from April 9-15, 2022, but only rainfall totals greater than 40 mm are shown. Several hundred mm accumulated near the coast between Durban and East London, and more than 600 mm along the track of "Issa" over the Indian Ocean.

Durban recorded a daily precipitation of about 300 mm on April 11-12, 2022, which is four times the usual April monthly precipitation of about 70 mm! And in other coastal areas southwest of Durban, rainfall was also equivalent to 2 to 4 times the average rainfall in April (Figure 4).

3. Consequences

"Issa" and the upper-level trough, with its associated extreme rainfall, became the storm event that claimed the most lives in South Africa's history. With at least 395 deaths, "Issa" surpassed the previous record set by tropical storm "Domoina" in 1984, which killed 60 people.

The masses of water swept away or washed out roads, and bridges could not withstand the force of the water. More than 40,000 residents in the coastal sections of KwaZulu-Natal in the Durban area were directly affected by the rains; 6,000 buildings were destroyed, 240 of them being schools. In the port of Durban, one of the busiest ports in Africa, several shipping containers were washed away and shipping operations were suspended. Estimates put the damage at several billion rand (several hundred million Euros). Although the authorities declared the province a disaster area immediately after the devastating rainfall and initiated extensive relief and rescue measures, voices were raised that poor drainage systems and inadequate building standards had increased the scale of the disaster.

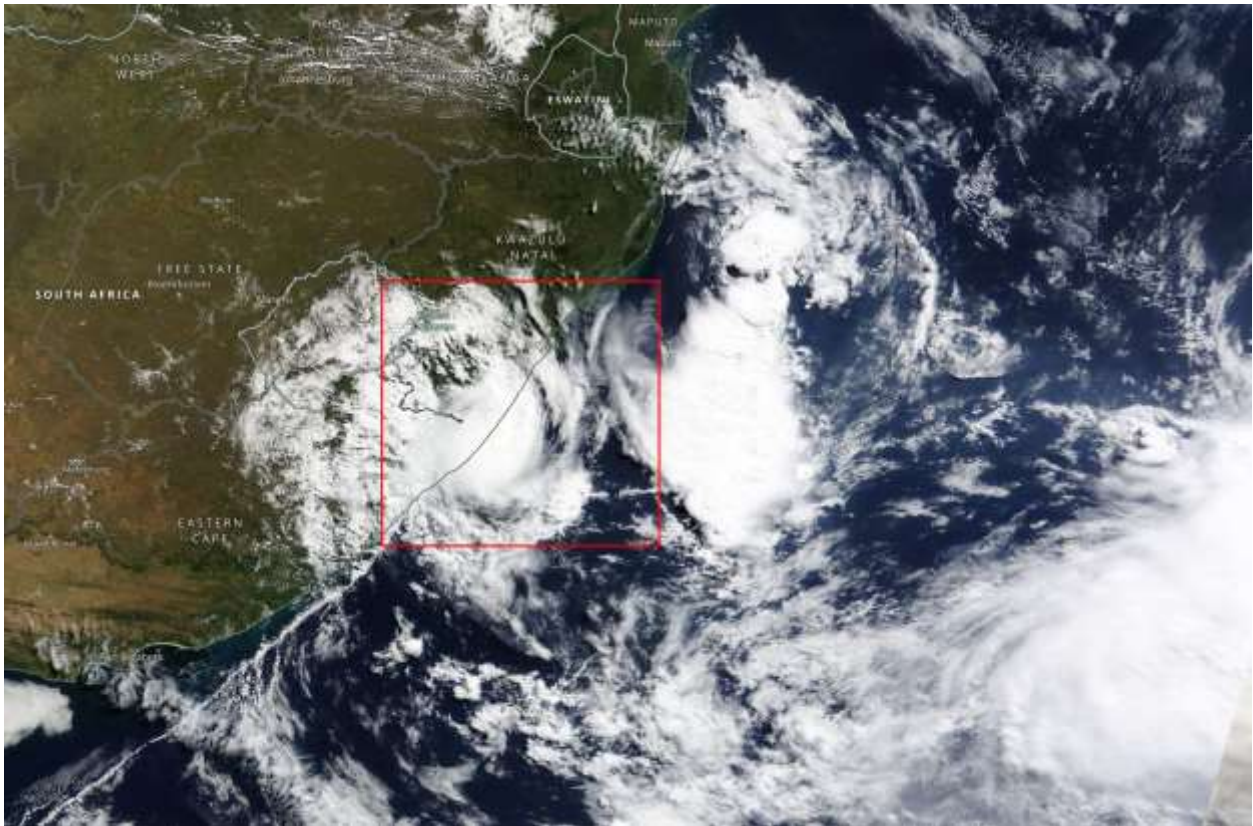


Figure 2: Satellite image on April 13, 2022 (Source: <https://worldview.earthdata.nasa.gov>).

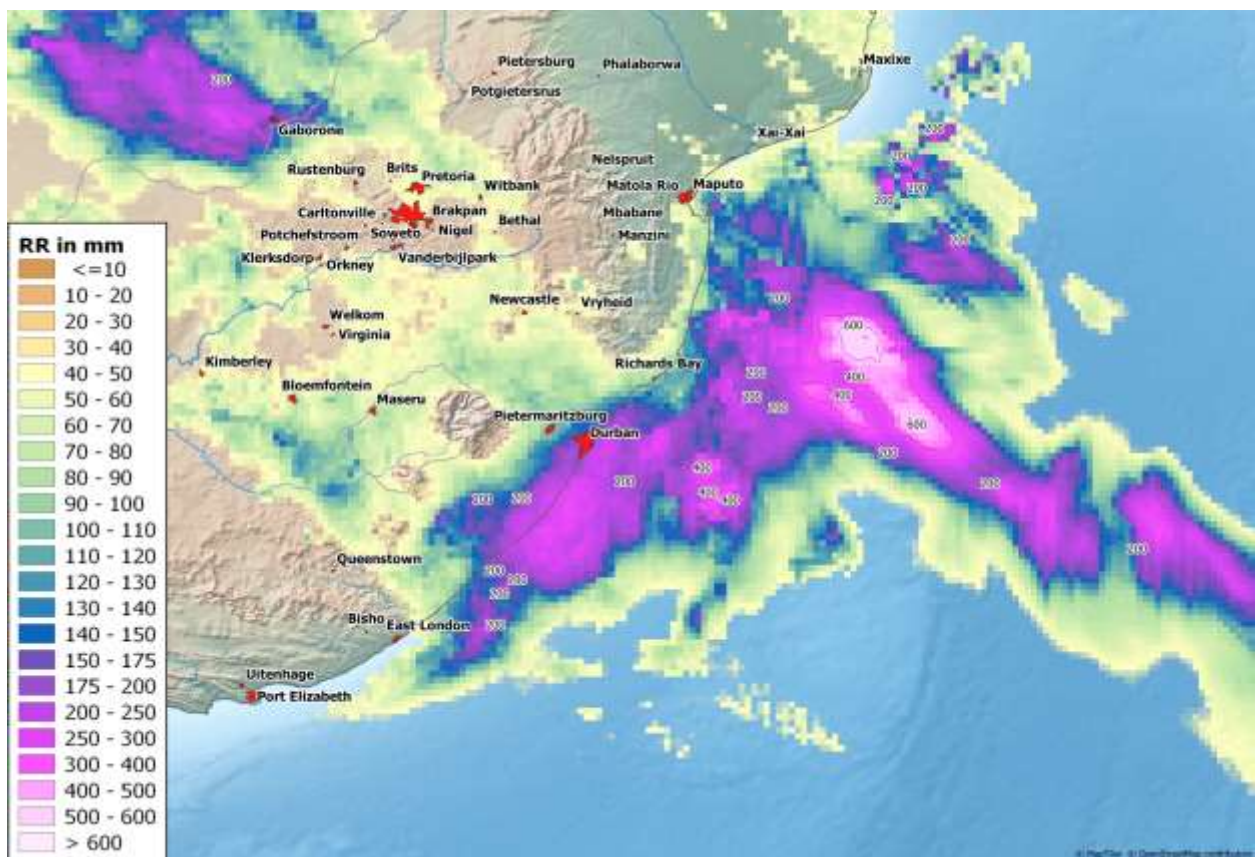


Figure 3: 7-day precipitation totals (in mm, only > 40 mm) during the period from April 9 to April 15, 2022 (Source: <https://gpm.nasa.gov>).



Figure 4: Percentage share of the 7-day precipitation total in the April monthly mean 2000-2019 in % (only areas with at least 100% are shown; source: <https://gpm.nasa.gov>).

4. References

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