

SOUTH-AFRICA'S MOST DEVASTATING HAILSTORM: AN SYNOPTIC SCALE UNDERSTANDING OF EVENTS

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$$HD = PD + GDP + HDF$$

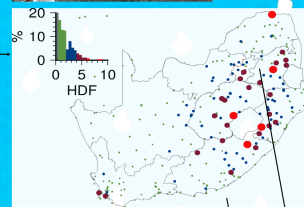
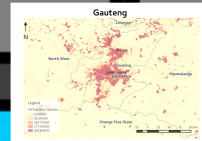
HD = Hail Damage Potential*

PD = Population Density

GDP = Gross Domestic Product

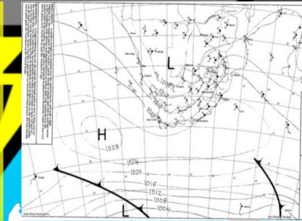
HDF = Hail Day Frequency

* Seemingly the perfect combination for devastation during a severe storm



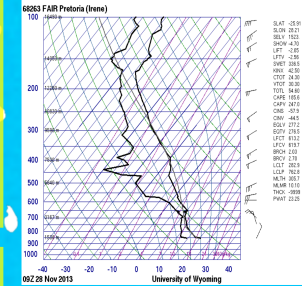
Synoptic Environment

In October and November 2013 several severe hailstorms caused havoc across the Gauteng Province. November was characterized by above average rainfall. In the days leading up to the 28 Nov storm a surface (850hPa) trough extended across the interior of South-Africa, with a ridging high-pressure system to its east, this allowed an influx of warm moist air from the Indian Ocean. The presence of a upper trough at 500hPa may have a high level of wind shear.



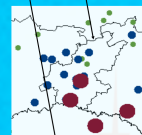
Upper-Air Sounding

Radiosonde data (University of Wyoming) showed several key variables associated with hailstorms. K-Index (42.50), Showalter (-4.70) and Lifted Index (-2.70), CAPE (185.5), TT (54.60), BRN (2.03) and the SWEAT index (336.5) all indicated highly unstable conditions in the atmosphere, ideal for the development of a supercell.



Johannesburg, Gauteng, located in the South-African Highveld is known as the economic hub of Africa.

On 28 November 2013 *"the most devastating storm in South-African history"* occurred over Johannesburg, resulted in over ZAR1.6 Billion in damages (US\$ 100million).

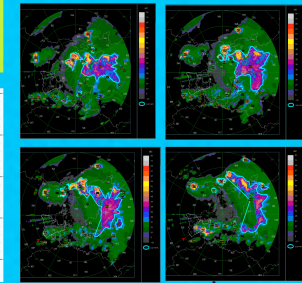
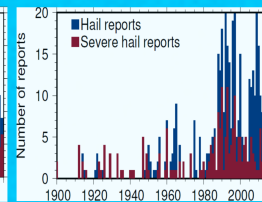
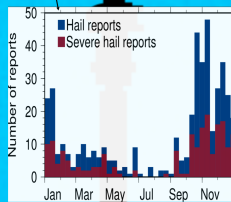


Radar Observations

Radar data of the storm day recorded reflectivity values upwards of 75dBz. Several hook echoes and bounded weak echo regions where also recorded.

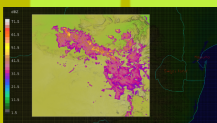
Johannesburg has the most reported severe hailstorms in the country, from 1911-2012 Johannesburg had 33 severe hail storms – far more than any other city in the country.

Over South-Africa hailstorms generally occur during the summer months of October through to March, characterized by a trough or low pressure system over the Highveld, not much different than normal thunderstorm producing conditions.

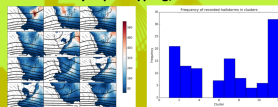


Future Research—WRF

High-Resolution WRF Simulations of hailstorm case-studies through Yellowstone Supercomputer—a first for South—Africa.



Future Research—Synoptic Typing, COST733class



Key References

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Acknowledgements

Special thanks to UCAR and NCAR for access to Yellowstone Supercomputer and their Research Data Archive (ark://85065/d7wd3che). Also special thanks Roelof, for always welcoming me into his office, and the countless hours we spend figuring out problems and finding new ones, Cindy Bruyere for the Skype sessions and help from the other side of world and finally Prof. Piketh, this project wouldn't have been possible by the funding provided by the NWU Climate Research Group under his leadership.

