Brand

Understanding, modelling and applications in atmospheric process studies

Theme

Applications-driven approach to atmospheric research, education and training

Research and Development: Meteorology
Strategic Alignment: 2024 - 2028

National, SADC, "Westward South-South" and North-South Collaboration; Generate Research Funding

Key Strategies	**Observations and Fundamental Processes**	**Short-term Weather Forecasting Techniques and Synoptic Systems**	**Weather and Climate Research**	**Atmospheric Composition Observations, Processes and Modelling**
Process studies	Apply and develop data analysis techniques; Extreme event analysis and attribution studies; General circulation of the atmosphere; Atmospheric energy conversions; Baroclinic life cycles; Downstream development	Hail climatology and synoptic circulation; Analysis of high impact (e.g. heavy rainfall) events	Idealised models, e.g., 2-layer models, dynamical cores and other models of intermediate complexity; CMIP6 and CORDEX data analyses	Ground-based measurements to improve understanding of N biogeochemical cycling, ozone chemistry and urban pollution; Satellite measurements of air pollutants concentrations, trends, emissions; Modelling to include urban pollution, linkages between natural and anthropogenic pollution; Pollen and microbes interactions with pollution
Forecasting techniques	Application of dynamic meteorology, including quasi-geostrophic analysis, tropical and extratropical dynamics	Hail forecasting; High impact event forecasting; Applying atmospheric profile and satellite data in forecasting	Statistical modelling; Statistical downscaling and correction using NMME and Copernicus archived and real-time data	No air quality forecasting activities planned
System development	Improved understanding of drivers of local weather and climate and identifying new ones; ENSO and the SH westerlies	Tailoring forecasts; Extreme weather predictability	Extremes forecasting; SST forecasting; Forecast verification; Applications and tailored forecasting	Assessment of modelling approaches to simulate air quality and atmospheric composition in southern Africa (e.g. RCM, CTM).

DAYS TO DECADES

Teaching Activities: Meteorology

Themes and Targets: 2024 - 2028

BSc and BSc (Honours)	Atmospheric Composition and Air Quality	Post-graduate Supervision
WMO compliant	Expand coverage of topics on atmospheric structure and processes	Strong alignment with research and development themes
New and modified lecture material; text book on SH dynamic meteorology and its general circulation	Reinvigorating of GLAS to support collaborations with UP atmospheric science community	15 MSc and 7 PhD graduated
Mathematical and computer solving approaches	Honours course (elective) that includes observations and modelling	Student exchanges from countries with political and developmental similarities, as well as with developed countries
Introducing Climate Change concepts and numerical modelling into curricula		Full-time students and postdocs
		30 peer-reviewed papers
		Increase in Postdocs

Computing: Meteorology

Themes and Targets: 2024 - 2028

GLAS (George Djolov Laboratory for Atmospheric Research) High-end computing facility for postgrads and research with remote access	Personal computing	Software
Study and model atmospheric processes	High-end computing laptops and desktop computers for modelling and analysis	Hands-on analysis routines for synoptic configurations
Store and manage large data volumes, including data from geostationary satellites and 3-D model simulations	Remote access to personal computers and computer centre through TeamViewer	Statistical modelling on a range of forecast time scales and applications
Development and testing of components of atmospheric models such as parameterization schemes		
Atmospheric pollution research and modelling		
Hosting of full-time MSc, PhD and Postdoc students		