

PhD Supervisor: Prof. Paul Groot (UCT/SAAO/Radboud)
Co-Supervisor: Dr Lisa Crause (SAAO)
Email address: paul.groot@uct.ac.za, lisa@sao.ac.za
Registration: Student will be expected to register at the University of Cape Town (UCT)
Project Title: **The SALT ReSAC Instrumentation project**
Type: **MSc**, within the UCT/SAAO-based SARChI group of Paul Groot

Project Description

1 Problem Statement

The Southern Africa Large Telescope is an 11-m diameter telescope located at the SAAO Sutherland observatory in the South African Karoo desert. It is the largest single-aperture telescope in the Southern Hemisphere and one of the largest optical-infrared telescopes in the world. Its unique design of a fixed-elevation and a spherical primary mirror presents some daunting challenges. One of these is that a spherical aberration corrector (SAC) is required. This is a four-mirror system that sits between the primary mirror and the instrument pay-load, located at the top of the tracker. The current SAC is more than 15 years old and needs to be replaced. This is the ReSAC project. The SALT Board has recently agreed to have this project go ahead, in collaboration with the NOVA Optical Infrared Instrumentation group in the Netherlands.

2 Aims and Objectives

This is an instrumentation-focused project where the student will be involved in all aspects of the ReSAC project. Expected start of the project is early 2026, aligned with the start of the MSc project. The student will orient themselves on the SALT telescope and its instrumentation. The student will be involved in the opto-mechanical design of the new SAC, as well as the manufacturing, verification and installation phases. The exact role of the student will be discussed with the team at SALT as well as with the team at NOVA, but can either be more on the telescope-impact side, or on the opto-mechanical design and manufacturing side. A project management role is also possible. This will be discussed with the student and the instrument team. The aim is to help bring the ReSAC project to a successful conclusion, and the objective is to train students in astronomical instrumentation and project management, such that they can serve in more senior roles within the South African facilities in the future.

3. Potential Impact

The impact of this project is to provide the SALT telescope with a new spherical aberration corrector which will not only bring the telescope back to its initially foreseen light gathering capabilities, but also addresses some of the structural weaknesses of the current SAC system, including accessibility and maintainability. The second impact will be to have a more instrumentation/engineering-type of MSc project that can potentially lead to a next-generation of instrument scientists, which is what the South African community needs for its future optical-infrared (and radio) facilities. The project takes full advantage of the expertise of Dr Lisa Crause (SALT Observatory Scientist) with SALT, and the expertise of Prof Paul Groot in leading cutting-edge new instrumentation (X-Shooter, MeerLICHT/BlackGEM, Flash).

4. Alignment with National Imperatives

This project aligns with the following national imperatives:

i) NRF Broad Category: Environmental, Material, Physical and Technology: Astronomy is a physical-technical discipline and strong usage will be made of cutting-edge technology in South Africa (MeerKAT, MeerLICHT, SALT, SAAO telescopes).

- ii) National Priority: Transformation: the training of transformed, science-and-technology based researchers is the basis of South Africa's future in the Fourth Industrial Revolution.
- iii) Grand Challenge: Astronomy: this project is astronomy, where usage is made of South Africa's cutting-edge technology to understand the Universe and our place in it.
- iv) Sustainability Goals: Quality Education. Astronomy is a STEM-discipline that forms the basis of the future development of South Africa and an educated population.

5. National Infrastructure Platforms:

SALT, SAAO.