EXPLORE

EXoPLanet Orbit REsearch

Version 1; 2025 March 6

Updated; 2025 March 11

Introduction

This document is a first pass at describing what the EXPLORE project does and what we are attempting to achieve. do. Over the next few weeks with, feedback from you all, I will refine it further.

With the exception of the Discovery Process where we need to dot every 'I' and cross every 'T' it is not intended to be overly prescriptive – more of a guiding hand.

Working Group

The Working Group includes; Rodney Buckland, Dennis Conti, Franky Dubois, Roger Dymock, Allan Schmitt, Trifon Trifonov, Siegfried Vanaverbeke and Pieter Vuylsteke

Objectives

- Identify planets showing TTVs from ExoClock, TESS and other databases
- Analyse TTV signals to constrain planetary system using; Exoplanetpie, LcTools and PlanSim
- Determine possible causes of TTVs i.e; extra planets, orbital decay, star-planet interaction
- Follow-up promising candidates e.g; new exoplanets, variable stars

Project outline (by Siegfried Vanaverbeke)

The EXPLORE 2000 initiative is a joint program of the Exoplanet Divisions of the British Astronomical Association (BAA) and the American Association of Variable Star Observers (AAVSO), designed to establish a coordinated, long-baseline monitoring effort of known transiting exoplanets. The project leverages a geographically distributed network of skilled amateur and professional observers to obtain high-precision transit photometry with dense temporal coverage. By aggregating these heterogeneous datasets within a unified analysis framework, EXPLORE aims to

refine transit parameters and search for statistically significant Transit Timing Variations (TTVs), which may reveal additional planetary companions, dynamical interactions, or other non-Keplerian perturbations in the systems. The program will identify TTV candidates by analysing data from sources such as TESS space-based and ground-based observations, ExoClock observations, and observations from NASA"s Exoplanet Watch program. The program provides standardized observing protocols, data-quality guidelines, reduction pipelines, and curated target lists optimized for TTV sensitivity. Through sustained community participation, EXPLORE seeks to complement space-based surveys and professional ground-based programs, extending the temporal baseline of exoplanet transit monitoring and enabling the detection of low-amplitude dynamical signals inaccessible to single-site or short-duration campaigns.

The various processes are shown on the following charts.

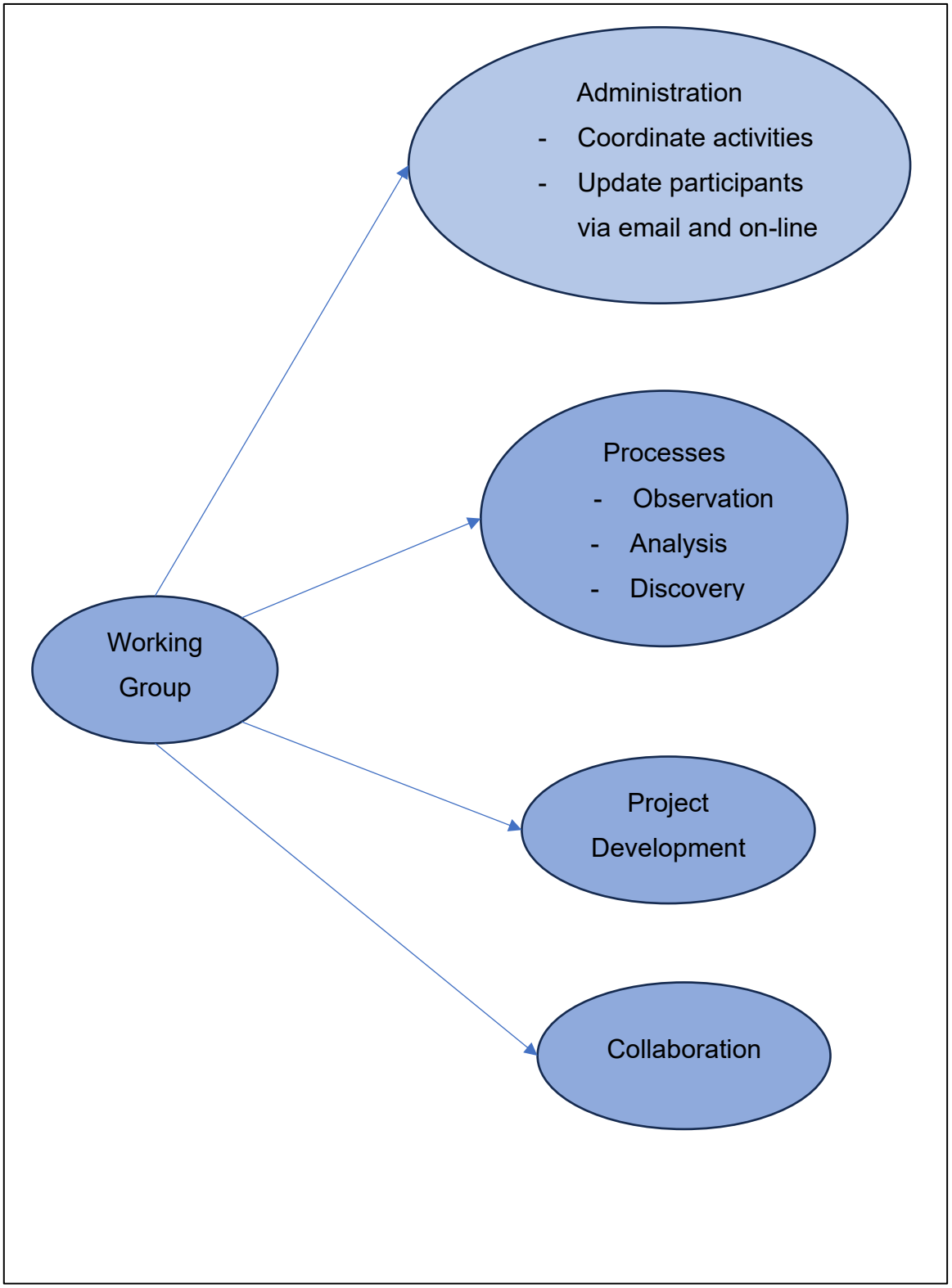
EXPLORE webpage

Includes project information;

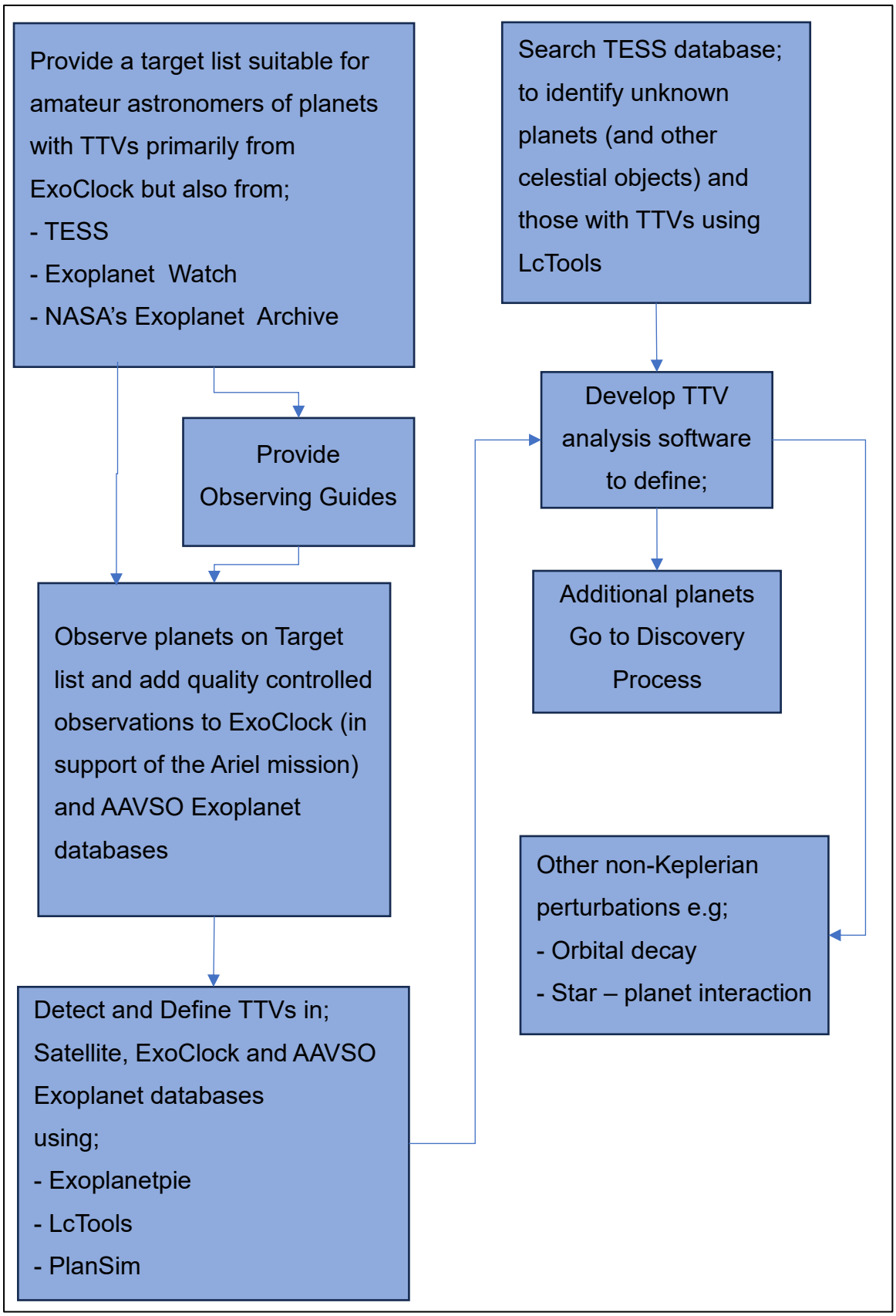
- target lists
- guides and tutorials
- links to software, papers and presentations

Roger Dymock

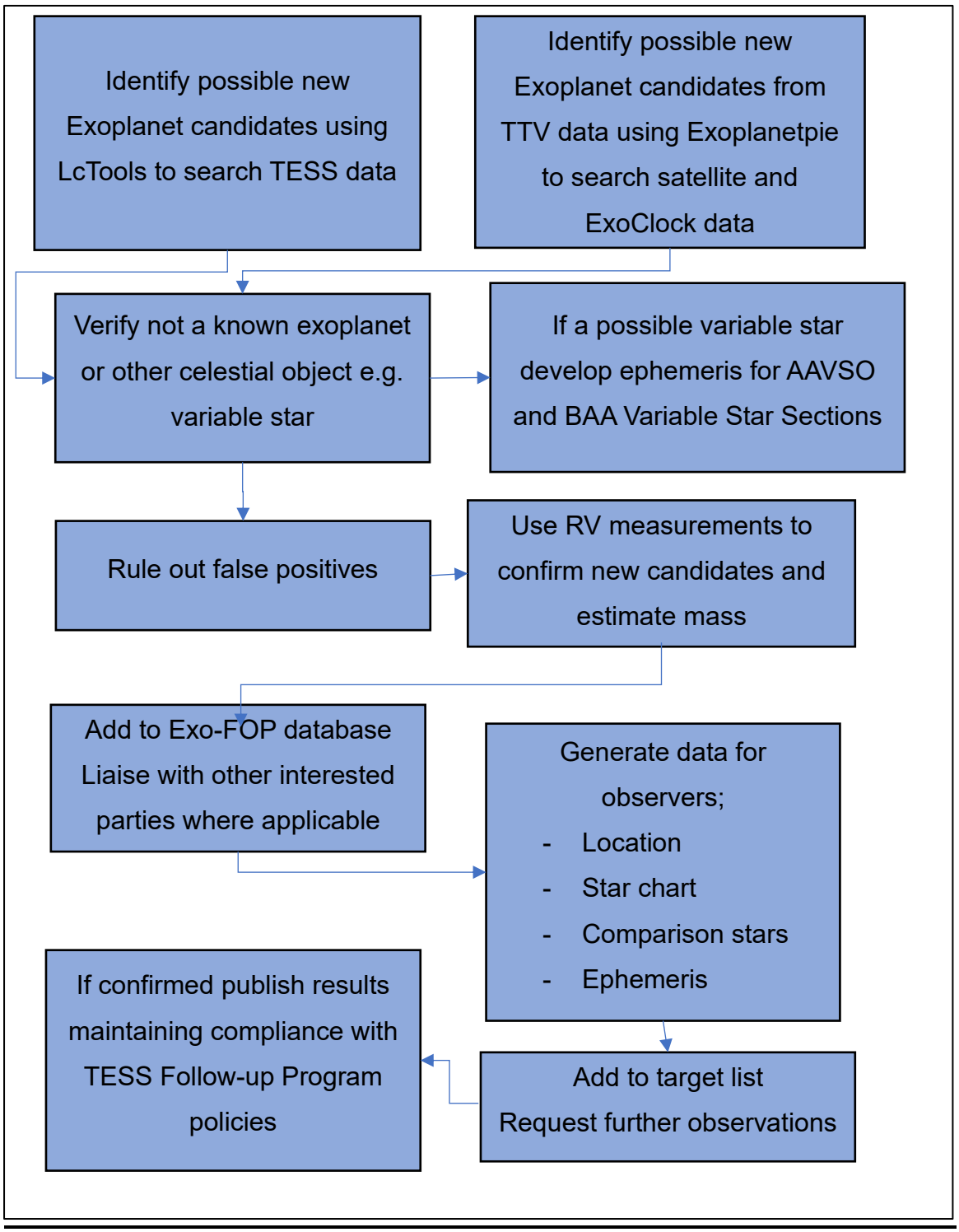
EXPLORE Overview



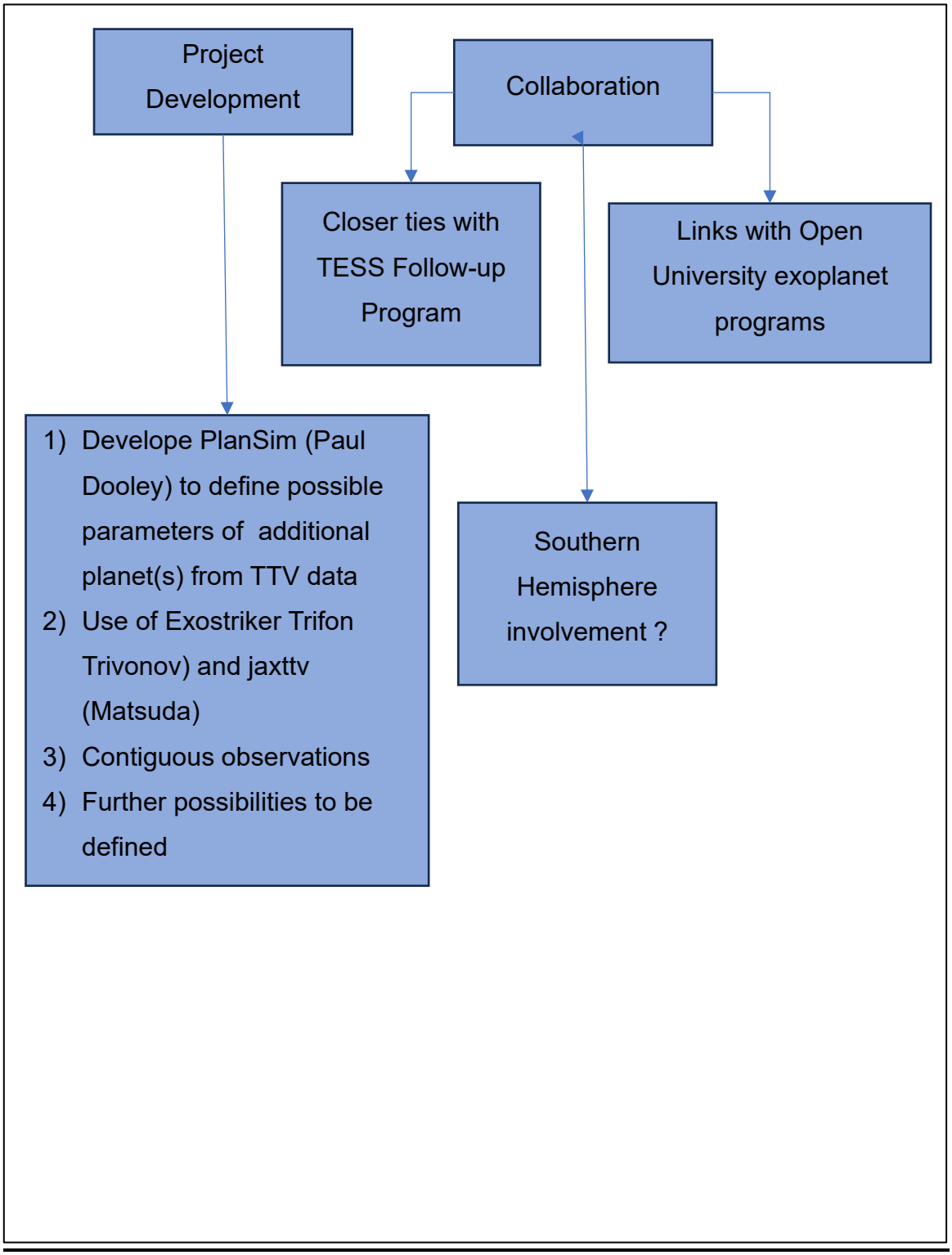
Observation and Analysis process

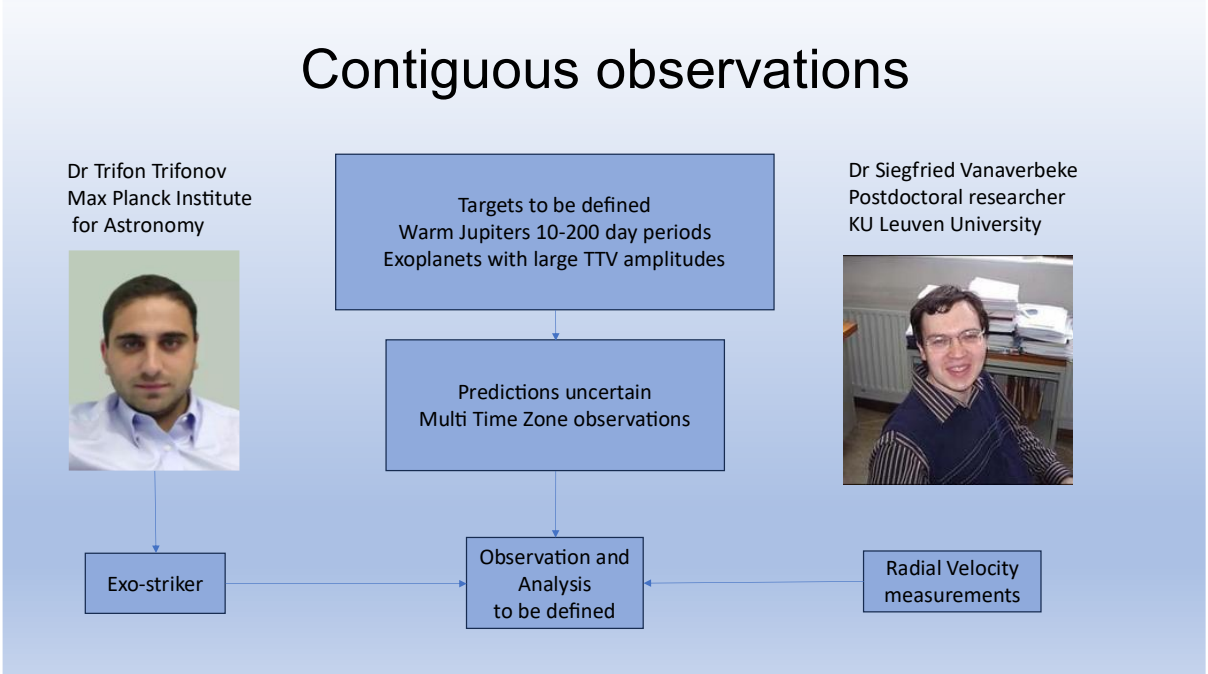
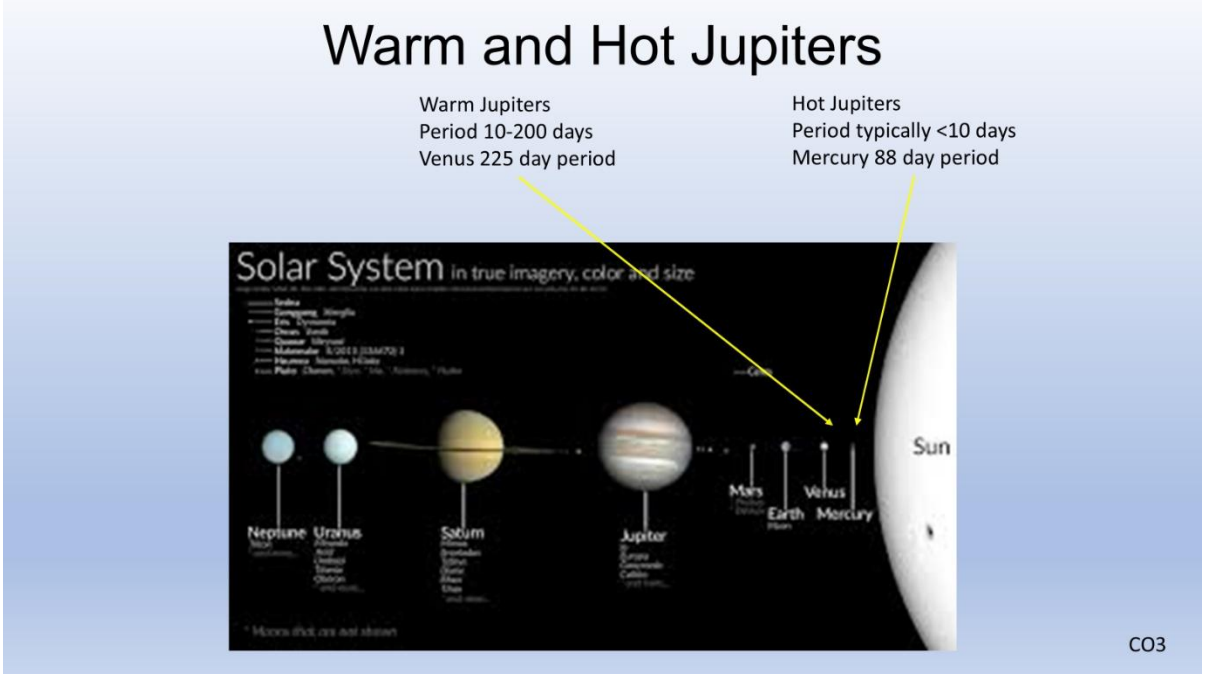


Discovery Process



Project Development and Collaboration



Project development – Contiguous observations

Below are two slides from a presentation given in 2025. They could form the basis for properly defined processes e.g; Target selection, Observation methods, data submission, analysis.