

1) Title:

Searching for new candidate sites over northern Chile by simulation and comparing with Gar site in China.

2) Host name(s) and the hosting institution(s)

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3) Keywords indicating research areas (e.g. Planets, Stars, Interstellar Medium, Galaxies, Cosmology, Instrumentation)

Astrometeorology, instrumentation, site survey, optical turbulence modeling, astronomical site, Gar site

4) Project abstract (< 500 words)

The Chinese Academy of Sciences (CAS) and the Comisión Nacional de Investigación Científica y Tecnológica (CONICYT) of Chile have decided to promote mutual collaborations in astronomical research between the two countries. China-Chile Joint Center for Astronomy (CCJCA) was founded in 2013 concentrating on developing astronomy research collaborations between China and Chile. For time domain astronomy, Chile and China are all the crucial nodes. For instance, Gar site in China and Cerro Tololo in Chile have been selected to install 1m telescopes node of LCOGT (Las Cumbres Observatory Global Telescope Network). Other collaborative programs that install telescope in Chile, such as Southern LAMOST (Large Sky Area Multi-Object Fiber Spectroscopy Telescope), multi-band survey telescopes, 50BiN/Song telescope have been proposed by Chinese scientist. Especially, the Southern LAMOST, as a copy of present LAMOST which is the first Chinese national mega-science project in astronomy, would highly upgraded the collaborative level between Chile and China.

Most of the efforts have been focused on the site selection in the last decade for the next-generation astronomical telescopes, involving E-ELT, the TMT and the GMT. Cerro Armazones and Las Campanas which located in Chile have been designated as the location for the E-ELT and GMT respectively. A systematic site testing data have been obtained at the sites of Cerro Armazones, Cerro Tololo, Cerro Tolonchar, Cerro Tolar, and Las Campanas. Site survey activities in western China have been carried out since 2003, in order to identify appropriate sites for constructing large and medium-size telescopes for East-Asian communities. Depending on remote studies and local surveys, the Gar site, which located at [E80.0283 N32.3234], south of Shiquanhe town in south-west Tibet, becomes the promising candidate. Preliminary results show that Gar site and nearby area can be the best choice for astronomical observations over the East Asian regions.

The purpose of this research is searching for new candidate sites in Chile and comparing the atmosphere conditions with Gar site in China for the future Chile-China Telescope(s).

The philosophy of site survey is to simulate meteorological parameters and optical turbulence parameters by a mesoscale non-hydrostatic meteorological model without the need of long and expensive site testing campaigns done with several instruments. The Weather Research and Forecasting Model (WRF) would be implemented to simulate the meteorological conditions over candidate sites. Considering the correlation between the C_n^2 and macroscopic mean profiles of the horizontal wind-speed component and temperature, the C_n^2 profiles and the integrated astrometeorologic parameters that derive from the C_n^2 : Fried parameters, the seeing, the isoplanatic angle and the wavefront coherence time would also be deduced.

The datum of previous site testing campaigns could be used to calibrate optical turbulence parameterization and validate the simulation results. The preferred candidate sites would be characterized by little cloud cover, high transparency and low background brightness, low PWD (precipitable water vapor), low wind speed with relatively stable direction, and weak optical turbulence or good seeing.