Central Asian Network (CAN) – the history and present status

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1. Creation of CAN

The necessity of long-term and continuous data for precise determination of frequency spectra of pulsating stars activated the creation of the asteroseismological networks of observatories with a good longitude coverage such as WET, DSN, STEPHI, STACC etc.

However, the Central-Asian gap in distribution of Northern observatories working in the known asteroseismological networks did not allow a safe continuous time coverage in the Central Asian region during the campaigns, especially in summer time.

In 1994, as a result of the agreement concluded between the team of researchers and administrations of four (Euro)Asian observatories: Astronomical Observatory of Odessa State University (AAOSU, Ukraine) and Mount Dushak-Erekdag Observatory (MDEO, Turkmenistan), Tien-Shan Astronomical Observatory (TSAO, Kazakhstan) and Abastumani Astrophysical Observatory (AbAO), the informal Central Asian Network (CAN) of researchers and observatories was created.

2. The CAN aims:

The main aim of the network created was carrying out coordinated photometric work and surveys on pulsating stars mainly on Delta Scuti, Lambda Boo and

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roAp stars visible in the Northern Hemisphere. Participation of all CAN sites in the intercontinental campaigns of other networks and groups is supposed to enhance the probability of continuous monitoring in Central Asia due to uniform longitude coverage of CAN observatories over 4 hour angles. In addition, the network was aimed at photometric support of the spectroscopic projects on large telescopes.

3. The CAN sites:

In Table 1 are presented some brief informations on CAN sites.

Table 1. The CAN sites and photometric telescopes

Observatory	Longitude	Latitude	Telescope(s)	Photometers
MDEO	+57°51'	+37° 56'	1.0 m	1024x1024 CCD camera *
			0.8	U,B,V,R,v (two-star)
TSAO	+76° 57'	+43° 11'	1.0 m	W,B,V,R
			0.48 m (West.)	W,B,V,R
			0.48 m (East.)	W,B,V,R
AbAO	+42° 49.5'	+41° 45.31'	1.25 m	u,v,b,y β
			0.48 m	U,B,V,R
			0.75 m	CCD camera
AOOSU	+30° 45.5'	+46° 28.6'	0.5 m	U,B,V,R
			0.48 m	CCD camera
				U,B,V,I,J,K

* CCD camera will be used from 1998 on, within the framework of a Vienna(IfA) - Odessa (AOOSU) cooperation.

3.1. Mount Dushak-Erekdag Observatory, Turkmenistan

The MDEO is jointly operated by the Institute of Physics and Technology of the Turkmenian Academy of Sciences, Turkmenistan and the Astronomical Observatory of the Odessa State University (Ukraine) (Dorokhov et al., 1995). The observatory is located at an altitude of 2020m on the slope of Mount Dushak-Erekdag, 5 km south-west and 450 m below the summit. Geographically, Mount Dushak Erekdag represents a single summit located directly at the border between the Kopet-Dag Mountains and the Kara-Kum Desert. The distribution of clear nights reaches its maximum in the summer-autumn season. According to the weather statistics between 1992 and 1997, the number of photometric nights during this period was about 80-90 %. The telescopes available for photometry are the 1.0 m Schwarzschild-type fast and wide-field telescope (1:1.8) of the Turkmenian Academy of Sciences, the 0.8m Ritchey-Chretien telescope of the Odessa Astronomical Observatory and the double-tube 2 x 0.5 m Cassegrain telescope of the Turkmenian Academy of Sciences.

3.2. Tien-Shan Astronomical Observatory, Kazakhstan

The TSAO is situated in the middle of Central Asia, within the Tien Shan mountain chain, 2800 m above sea level. The distribution of clear nights at TSAO reaches its maximum in autumn and winter, when a clear sky is rare at most European observatories and well complements the clear period in Europe. TSAO is jointly operated by the Fesenkov Astrophysical Institute of the National Academy of Sciences of Kazakhstan and the Sternberg State Astronomical Institute (Russia). The facilities available for photometry are the 1.0 m Zeiss Ritchey-Chretien and two 0.48 m Cassegrain telescopes with two 4 channel W,B,V,R photometers attached to them.

3.3. Abastumani Astrophysical Observatory, Georgia

The Abastumani Astrophysical Observatory (AbAO) of the Academy of Sciences of Georgia is placed in South-West Georgia between the ranges of Small Caucasus, at an altitude of 1700 m above sea level. The distribution of clear nights at AbAO amounts to its maximum in summer-autumn and winter periods. The 1.25 m Ritchey Chretien telescope equipped with a two-star photometer, the 0.7 m Maksutov and the 0.48 m Cassegrain telescopes are available for photometric observations.

3.4. Astronomical Observatory of Odessa State University, Ukraine

For extending the CAN sites to the West during the CAN campaigns, we used the additional Western tracking site in Ukraine - the Mayaki Station of the Astronomical Observatory of the Odessa State University (AOOSU). The Mayaki Station is located 45 km north-west of Odessa. The climate is typical for Eastern Europe with a maximum of clear nights in the August-September period. Two photometric 0.48m and 0.5m telescopes are available for photometry.

4. Activity of CAN

Since the date of creation of CAN and during its 1994-1996 activity, mainly the Eastern wing of the network (MDEO – TSAO) was working, while from 1997 on, the Eastern and Western (MDEO – AbAO) wings began working jointly. According to the strategy of CAN we organized and took part in the campaigns of other groups on the following projects for different types of pulsating stars:

4.1. Ap stars:

- **1994, September:** The Northern sky rapid photometry survey of faint Ap stars in Kapteyn Selected Areas (PI, D. Mkrtichian) was started at MDEO and continued in 1995-1996 at TSHAO (PI, A. Kusakin).
- **1994 September:** A two-site photometric (MDEO) and radial velocity (Simeiz Observatory, Ukraine) mini-campaign on the roAp star γ Equ (PI, D.E. Mkrtichian) was carried out.
- **1994, September:** MDEO and TSAO took part in a multisite photometric campaign on the chemically peculiar star ET And (PI, W.W. Weiss, IfA, Vienna)

– **1995, March:** The CAN site TSHAO (observer, A. Kusakin) and Konkoly Observatory (observer, M. Paparó) supported the spectroscopic work made with the SAO 6.0 m telescope on the chemically peculiar SrCrEu star 49 Cam (PI, D.E. Mkrtichian, AOOSU).

4.2. δ Scuti stars :

– **1994, November:** MDEO and TSAO took part in the DSN 12 campaign on the δ Scuti-type star θ^2 Tau (PI, M.Breger, IfA, Vienna).

– **1994, November and 1995, March:** The CAN site TSHAO (obs. A. Kusakin) and Konkoly Obs. (obs. M. Paparó) supported spectroscopic work made with the SAO 6.0 m telescope on the δ Sct star VW Ari (PI, D.E. Mkrtichian, AOOSU).

– **1997, March - May:** All CAN sites – AbAO, MDEO and TSAO – together with the Austrian 0.75 APT (Arizona) took part in a 3-month (1 March–1 June) DSN 17 multisite photometric campaign on the δ Scuti star 4 CVn (PI, M. Breger, IfA, Vienna). Data of 43 nights were acquired from CAN sites in addition to 50 APT nights.

– **1997, September – October:** The multisite monitoring of the eclipsing binary δ Scuti star AB Cas was carried out at AOOSU, TSAO and AbAO.

4.3. λ Boo stars:

– **1995/1996 :** The survey of λ Boo stars was carried out at TSHAO (Obs.: A. Kusakin) and 3 objects were observed to search for pulsational variability.

– **1995, July-September:** Photometric work was devoted to the Λ Boo star 29 Cyg by using TSAO as the basic observing site (Kusakin & Mkrtichian, 1996).

– **1996, July-September:** The first, July-September multisite spectroscopic and photometric campaign on 29 Cyg was undertaken by CAN (PI, D. Mkrtichian) the main observing sites being TSAO, Crimean Astrophysical Observatory (CrAO), Konkoly Observatory, Ege University Observatory, University of Toronto Observatory and Hawaii University Observatory (Mkrtichian et al., 1998). 48 photometric and 2 spectroscopic nights were acquired.

– **1997, July - October** - The second multisite photometric and spectroscopic campaign on the pulsating λ Boo star 29 Cyg coordinated by CAN (PI, D. Mkrtichian) was undertaken with the participating observatories AOOSU, TSAO, CrAO, TUBITAK Observatory (Turkey), AbAO and Austrian APT (Arizona). More than 80 photometric and 2 simultaneous spectroscopic nights were acquired.

5. Further work

The three years of CAN activity have shown the expected efficiency of the network, satisfactory weather conditions and the good quality of photometry at each site. Further strategy of CAN was re-discussed by PI's in early 1997 and aimed at:

– Continuation of deep asteroseismological investigation and data collection on selected Lambda Boo stars.

– Continuation of the survey of roAp stars in the Northern sky.

– Search for pulsating components in eclipsing binary systems and investigations of them.

– Participation in intercontinental multisite campaigns of other groups.

According to the newly developed CAN strategy, we have the following schedule of CAN projects in the immediate future:

– **1998:** - Third multi-site photometric and spectroscopic campaign on the pulsating λ Boo star 29 Cyg (PI, D. Mkrtichian)

– **1997/1998:** - Monitoring of the δ Scuti stars AB Cas, Y Cam and V577 Oph, which are members of known eclipsing systems (PIs, D. Mkrtichian, A. Kusakin).

– **1997/1998:** Search for new pulsating A-F components of selected eclipsing binary systems (PI, E. Janiashvili).

– **1998:** Continuation of the survey of roAp stars in the Northern sky, in Selected Kapteyn Areas and in associations (PI, D. Mkrtichian).

6. Collaboration with other groups

CAN is open to suggestions from other groups for participation in their campaigns. Requests for detailed information on the activity of CAN, forthcoming campaigns and suggestions can be addressed to MDE at the e-mail address: david@oao.odessa.ua.

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