

OBSERVING GRAVITATIONAL LENSES

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We have first reported on results of gravitational lensing statistics as applied to a sample of 469 highly luminous quasars that were observed in a collaborative effort with J.F. Claeskens, D. Crampton, A.V. Filippenko, D. Hutsemekers, P. Magain, B. Pirenne, C. Vanderriest and H.K.C. Yee (see a detailed report of this work in ESO preprint No 898).

The objects were directly imaged, either from the ground (ESO, CFH) under optimal seeing conditions, or using the Hubble Space Telescope. We have derived values for the effectiveness parameter F of galaxies, modeled by means of singular isothermal spheres, to produce macro-lensed images of distant quasars, and upper limits on the density parameter Ω_L of compact objects with masses $\simeq 10^{10} - 10^{12} M_\odot$. Adopting $H_0 = 50$ km/sec/Mpc, $\Omega_o = 1$ and $\Lambda = 0$, we found that at the 99.7% confidence level, $0.006 < F < 0.595$ and that $\Omega_L < 0.01$. A critical discussion of these results was presented. Comparing the efficiencies of ground-based and space instruments used to search for gravitational lens systems among highly luminous quasars, we concluded that for the near future, ground-based direct imaging characterized by a good dynamical range still constitutes the best observational strategy.

In the same framework of gravitational lens studies, we have then presented new observational and theoretical evidences supporting the existence of associations between highly luminous quasars and galaxies ($19 < R < 22$) at small angular scales (typically $3''$). A complete study of this work by Van Drom et al. will be reported soon in the *Astron. & Astrophys. journal*.

Finally, we have presented a new case of multiply lensed quasar and two very tight associations ($< 5''$) between quasars with different redshifts. It was pointed out that the probability of finding two such unusual associations is very unlikely (Surdej et al., in preparation).

SUMMARY OF GENERAL DISCUSSION

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After presentation of 13 different talks during this 2nd Oslo mini workshop on Gravitational Lenses, a general discussion took place at the end of the meeting. An agenda was first adopted and a summary of the main points which were discussed is given hereafter:

1. Following the scientific needs felt by the european gravitational lens community, represented at this (and also previous) meeting(s), to have a telescope fully dedicated for the optical photometric (and also possibly, spectroscopic) monitoring of multiply lensed sources, it was recommended to organize a 'European Conference' on this topics during the coming year. It was suggested that J. Schramm (Hamburg Observatory) and P. Magain (Institut d'Astrophysique de Liege) take some action (organisational matters , formation of a scientific committee, etc.)

2. Once more, we all agreed that in the spirit of a collaboration (and not competition), an exchange of CCD frames collected within the various photometric monitoring campaigns of multiply lensed quasars (0957+561, 0142-100, 2237+035, 1413+117 and 1115+080) with the NOT and other telescopes at ESO, Calar Alto, CFH, etc. should be made between the different european teams involved in such programs. The CCD frames will be selected and mailed in the near future by R. Stabell (Oslo), Ch. Vanderriest (Meudon), M. Remy (Liege) and J. Schramm (Hamburg). It was agreed that the teams which collected first the observations should publish their own data before the other teams are given permission to use them. Simulated data for an artificial GL system bearing some ressemblance to 2237+0305 will also be prepared and made available to the different teams in order to compare the efficiency of the different data analysis methods used at the various observatories (J. Surdej will search for someone who is neutral and willing to do this). All data should be in FITS format and flat-fielded, if possible.

3. Lists of HLQs that were already observed in the direct imagery mode with the NOT and other telescopes at ESO, Calar Alto, CFH, etc. should be made available in the near future in order to avoid the duplication of future observations. It was also felt that an exchange of the relevant CCD frames should also be organized between the different groups (action will be taken by R. Stabell, J. Schramm, E. Van Drom and J. Surdej). A compilation of existing high- and moderate- resolution spectra of bright quasars will be undertaken by U. Borgeest.

4. Future exchanges between european astronomers (including students) should be organized in the near future. Such a first exchange could take place between astronomers involved in the reduction and analysis of direct CCD frames of multiply lensed quasars (action could be taken by P. Magain, if he agrees).

5. In the context of the International Space Year (ISY) World Astronomy Day (WAD) campaign of multi-wavelength observations of H1413+117, M. Remy and J. Surdej informed the participants that VLA observations (2cm, A configuration) of this system will take place around 30 January, 1993. Parallel optical observations (direct CCD imagery, spectroscopy, polarimetry) of this gravitational lens system are very much wanted. A scientific collaboration will of course emerge from the comparison of all these data. A second campaign of observations will take place around the new moons in March and April for 1413+117 and September 1993 for 2237+0305. Interested parties should contact M. Remy or J. Surdej (ISYWAD at BLIULG11.BITNET or ISYWAD at VM1.ULG.AC.BE, Fax: 32-41-527474, Institut d'Astrophysique de Liege, 5 avenue de Cointe, B-4000 Liege)

6. A general bibliography on gravitational lenses is being compiled in Liege and should be made soon available to all astronomers with some interest in this field. As a contribution to this effort, it would be very much appreciated if you could in the future forward new preprints or reprints of your GL work directly to A. Pospieszalska-Surdej, Institut d'Astrophysique de Liege, 5 avenue de Cointe, B-4000 Liege).