fluxes of D_α and D_β being quite similar, the next deuterium Balmer lines are likely to be detectable. A careful study of the deuterium Balmer decrement may lead to a new determination of D/H.

Using the same configuration, we obtained spectra of six planetary nebulae (PNe). We did not detect any line at the D_α and D_β wavelengths. Deuterium is believed to be much depleted in PNe owing to its destruction in the parent stars. Indeed, deuterium has never been observed in PNe by whatever means. Nevertheless, our data can lead to interesting upper limits to D/H. In the case of NGC 6572, we provisionally obtain $(D/H)_{NGC\ 6572} < 1 \times 10^{-7}$. To our knowledge, this is the most stringent upper limit to D/H ever found for a PN.

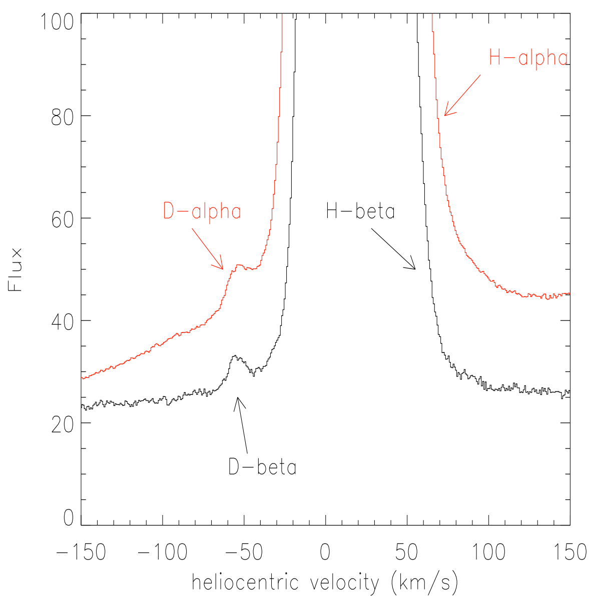

Figure 1: Detection of D_α and D_β in Orion. The vertical scale corresponds to peak fluxes 7250 and 2500 for H_α and H_β respectively.

We suspect that D I Balmer lines have already been detected in HII regions but have never been recognized as such. The present results suggest that Balmer deuteriun fluorescence is a very sensitive way to *detect* deuterium. This is due to the large photoexcitation cross sections involved. With the new generation of very large telescopes, it is foreseen that these lines will become detectable in low-metallicity extragalactic H II regions. These regions being in young galaxies, it will possibly lead to a new determination of the primordial abundance of deuterium.

References :

Hébrard, G., Pequignot, D., Vidal-Madjar, A., Walsh, J.R., & Ferlet, R.: 2000, accepted for publication in *A&A Letters* (astro-ph/0002141)

Lemoine, M., Audouze, J., Ben Jaffel, L., Feldman, P., Ferlet, R., Hébrard, G., Jenkins, E.~B., Mallouris, C., Moos, W., Sembach, K., Sonneborn, G., Vidal-Madjar, A., & York, D.~G.: 1999, *New Astronomy,* 4, 231 (astro-ph/9903043)

CFHT Harvests Distant Supernova - and sets a record!

A report from the High-Z supernova Team

Robert Kirshner- *Center for Astrohpysics, Cambridge, USA*

John Tonry- *Institute for Astronomy, Hawaii, USA*

John Tonry, University of Hawaii, and a large international crew from the High-Z Supernova Team were at it again in October and November, using the 12K mosaic imager at the CFHT Prime Focus to find very distant supernovae-- including “Dudley Doright” (officially known as SN 1999fv) at z= 1.23, the most distant exploding star ever reported. In the past few years, the High-Z Team (which maintains a website at http://cfa-www.harvard.edu/cfa/oir/Research/supernova/HighZ.html) and the Supernova Cosmology Project, have used observations of Type Ia supernovae (the type from exploding white dwarfs) as standard candles to populate the redshift-magnitude diagram up to redshift 1. This work, cited as Science Breakthrough of the Year by Science Magazine for 1998, gives evidence for cosmic acceleration and the possible existence of a cosmological constant, known as Lambda. “While the statistical evidence looks good, there could be systematic effects, and I wouldn’t even bet YOUR life on Lambda yet,” Tonry said. For this run, the High-Z team used I-band filters to match the redshifted energy distribution from Type Ia supernovae at a redshift of 1 or more in hopes of learning whether the expansion of the Universe switched gears from cosmic deceleration at high redshift when the Universe was dense to acceleration at more recent epoch. “This would be the smoking gun,” Tonry remarked. “Dust, age differences, and chemical abundance changes might affect the peak brightness of these exploding white dwarfs, but they’re not going to change sign the way a real cosmological effect would. If we see that, we know it’s Lambda.”

The team reported 20 new supernovae in IAU Circular 7312, found by comparing images taken at CFHT on October 3,4, 7 and 8 with a fresh set taken on November 2 and 3. The pairs of images are registered, scaled, subtracted and searched by software developed by the High-Z Team. Saurabh Jha, a Harvard University graduate student working with the team, carried a portable computer from Australia, where the software was modified, to Hawaii for this observing run, and then on to CTIO in Chile for follow-up observations on November 6 and 7 with the 4-m Blanco telescope. “The software is in better shape than I am,” Jha quipped on arriving in La Serena. In Chile, Nick Suntzeff of the CTIO staff, led an effort to confirm and extend the CFHT findings. In order to improve the efficiency of use of CFHT these same data are being analyzed by Gerard Luppino and Nick Kaiser at the IFA for weak lensing, and by Eugene Magnier at CFH for comets, asteroids, and Kuiper Belt objects.

Unlike ordinary astronomical observations which can be reduced after the observers recover from the observing run, the supernova data are perishable, and data processing needs to be completed immediately so observations of spectra and light curves can begin. While Peter Garnavich (CfA) and B. Barris (U of H) were at the CFHT taking the second-epoch data, Tonry, Jha, team leader Brian Schmidt from Australia, and others pounded away to do the subtractions. The data link between Mauna Kea and Manoa was barely able to keep up with the flood of data, exceeding 10 Gbyte per night. To keep track of the candidates, they gave them whimsical names based on cartoon characters, including Boris, Natasha, Mr. Peabody, Snidely Whiplash, and the record-setting Dudley Doright (a RCMP Mountie from the "Rocky and Bullwinkle" TV show). "It's silly, but it fits our team, " commented Brian Schmidt. "The only problem is, you get emotional about your favorites."

The team was successful in finding a rich harvest of distant supernovae, including 4 with redshifts greater than 1, demonstrating the effectiveness of the 12 K mosaic and CFHT for this work. Although the search and ground-based follow up went well, the team was disappointed when the Hubble Space Telescope lost its third gyro in mid-November just as their HST observing program on the supernovae was scheduled to begin. "I'm totally bummed," said High-Z Team member Alex Filippenko (UC-Berkeley) "but this shows we can find those z = 1 guys. The CFHT was awesome."

Observations by Tonry and by Filippenko and collaborators with Keck-2 on November 8,9,12,13, and 14 confirmed the nature of the objects and provided the redshifts. Further follow up with the VLT at ESO in Chile, at CTIO, and on Mauna Kea at the UH 2.2 meter established the light curves so that these new supernovae can join the Hubble diagram and test the case for a cosmological constant. "We're not there yet," says Tonry, "but we're going to pin that constant down."

Nice pictures of some of our supernovae can be viewed at the following web site: http://cfa-www.harvard.edu/cfa/oir/Research/supernova/

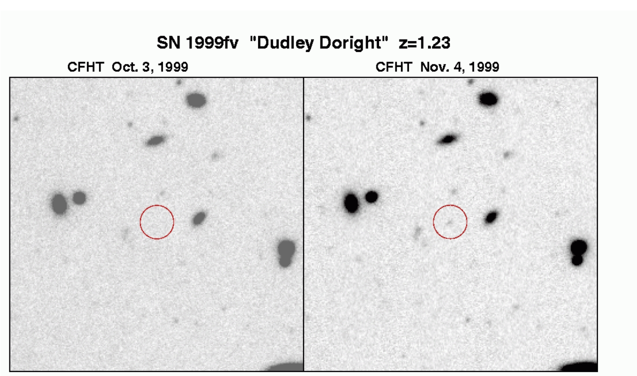

Figure 1: Supernova "Dudley Doright" at z=1.23 recently discovered at the CFHT. This is currently the most distant supernova observed.

FORUM

L'avenir de la haute résolution angulaire au TCFH

Olivier Lai *- CFHT*

Note*. Les points de vue exprimés dans cet article sont ceux de l'auteur et ne représentent aucunement la politique ou les opinions du TCFH.*

Résumé J'examine quelles sont les possibilités d'avenir pour la haute résolution angulaire au TCFH. A court terme, l'on peut penser à de nombreuses améliorations possibles de PUEO, en fonction des besoins scientifiques, du budget, mais aussi de ce qui se fait ailleurs sur la montagne et dans la communauté de la haute résolution angulaire. Par ailleurs, le projet interférométrique OHANA commence à prendre forme, et le TCFH se prépare à y jouer un rôle important. Enfin, à plus long terme, on peut considérer des options pour le remplacement du TCFH qui favoriseraient la haute résolution angulaire de manière innovante, c'est-à-dire sans vouloir entrer en competiton avec les télescopes géants existants, mais en définissant un espace unique, dont le point fort serait l'imagerie à fort contraste.

Introduction

Le TCFH excelle dans les domaines du très grand et aussi du très petit. En effet, si la caméra CFH12K est l'envie de la communauté du Mauna Kea, il en est de même pour les détails, la résolution et la dynamique obtenus grâce à PUEO, la bonnette d'optique adaptative. En effet, après la première lumière du système d'optique adaptative du Keck en février 1999 et la première lumière corrigée d'optique adaptative de GEMINI en juin, on pourrait être en droit de se demander si cette envie a encore lieu d'être, et pour combien de temps. Lorsque l'on compare différents sytèmes d'optique adaptative, il est important de prendre en compte tous les paramètres. Les records actuels sont détenus par le Keck, avec la limite de résolution d'un télescope de 10 mètres en bande K (soit 45 millisecondes d'angle à 2.2µm avec $m_r < 11$ pour l'étoile guide), ou encore 21 millisecondes d'angle sur une image courte pose à 850 nm sur une étoile de magnitude V = 4.5. Cependant, comme on le sait, beaucoup d'astrophysique se fait avec 0.1" de résolution, si l'on a accès à des objets dont la magnitude est plus élevée. C'est la raison pour laquelle PUEO garde, pour l'instant, un "espace unique", c'est-à-dire un espace dans le domaine de paramètres FWHM(λ, r_0 ,m_r) (la résolution obtenue est fonction de la longueur d'onde d'observation, des conditions de turbulence et de la magnitude de l'étoile guide). En fonction des besoins scientifiques, y a-t-il des solutions, des améliorations que l'on peut apporter à PUEO pour préserver cet espace unique?

Améliorations de PUEO

Le TCFH, doté de PUEO est l'un des seuls systèmes d'optique adaptative capable d'obtenir des images sur des objets relativement faibles, notamment extragalactiques. Il s'ouvre alors deux voies: l'une est d'essayer de préserver cet avantage face à des systèmes ambitieux (dotés d'étoiles lasers), qui fonctionneront sans aucun doute, mais peut- être dans des délais suffisants pour justifier des modifications de