

maximum single deviations for all comparison stars and compared them with those of the programme stars (Fig. 2). Here we see that the comparison stars have a distinct, small scattering frequency distribution (except for the two stars found to be variable) with a mean value near 0.012 mag – for the *maximum* deviation, *nota bene!* – the programme stars, on the other hand, show a clear displacement to larger deviations, the three extremes lying far outside of our diagram. This indicates a general tendency towards variability, especially in view of the fact that a maximum of 5 observations per star is not sufficient for catching each possible variable.

From the listed data we see:

1. 9 out of 15 stars (60%) exhibit H α emission, 6 of them with more or less typical P Cygni line profiles (3 B, 1 A and 2 G stars, the latter with complex profiles, as shown in Fig. 1), 2 more with reverse P Cygni profiles (B, F) and 1 star with weakly indicated emission (B), possibly another P Cygni candidate.
2. The radial velocities of the P Cygni absorption components (edge of short wavelength wing) relative to the system velocities show a slight dependence on spectral type: for early B stars we find values around –200 km/s, for A stars around –100 km/s. The two G stars with complex profiles have again velocities of about –200 km/s.
3. 10 out of 26 stars (38%) are clearly variable with deviations of more than 4 standard deviations from the respective mean of the comparison stars, at least 7 more (27%) can be classified as suspected variable stars (deviations between 2 and 4 standard deviations).
4. 7 stars (78%), possibly 8 (89%), out of 9 emission line stars are variables or suspected variables. The 4 photometrically observed stars without visible emission features include 2 apparently non-variable stars (types A and G), 1 suspected (B) and 1 variable star (B).
5. Among the variables are 7 newly found variables: HR 4169, 4438, 4511, 4887, 6131, 6142, 6155.
6. Among the 17 stars of spectral types later than B9 we find the most clearly non-variable as well as the variable stars with largest amplitudes (HR 4169, 4441 and

7066), while the 9 stars of types B0 to B5 are all variable with low amplitudes (Fig. 3).

Our results may be summarized in this way:

Variability and the existence of P Cygni or emission lines in stellar spectra seem to be a rather common feature among supergiant stars of early and medium spectral types. A good correlation exists between the presence of emission lines, mainly of P Cygni type, and the presence of variability. Vice versa, this does not hold as well: variable supergiants do not always show indications of spectral emissions, at least in our limited sample of spectra. It is quite conceivable that this absence can be explained by short-term weakening of the emission lines, especially if irregular, possibly eruptive mechanisms of stellar mass loss play a role. The detection of line variations of this type was one of our original programme points which had to be omitted due to bad weather. When this weakening occurs we would generally expect a lower tendency towards variability which is not in contradiction with our data. Among the 4 non-emission-line stars we find 3 non-variables which is, compared with the emission-line stars, a distinct but not significant increase in the number of quiescent objects.

Possible quiet phases during the supergiant stage, which may be restricted to limited regions of the HRD, certainly pertain to the nature of the driving mechanisms of the mass flow. The behaviour of the early B type stars with their weak but always visible activity is sufficiently different from the behaviour of the A to G types which show a separation into inactive and strongly active groups. This is observational evidence of different driving mechanisms in addition to more theoretical considerations employed so far. For B stars the "superficial" causes (coronae, photospheric radiation pressure) may indeed be solely responsible, whereas the later stars could be transition types to the cool stars with deeper-lying phenomena related to their outer convection zones. In this intermediary group not all members may be able to fulfil the necessary conditions for being variable.

As usual we must conclude that further observations are needed. One fact however is evident: the supergiant stars, this mildly spectacular phase of stellar evolution, play a more and more important role for mass loss among stars. Possibly, they begin to rival the supernovae, these most popular objects regarding mass loss!

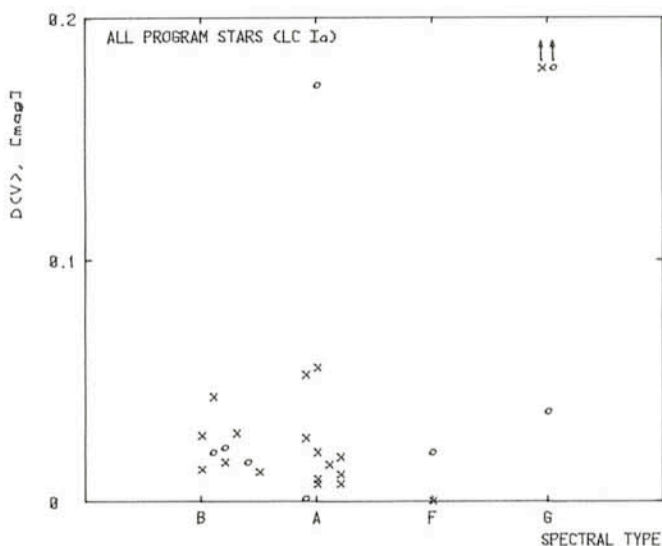


Fig. 3: Maximum single deviation (absolute value) of V magnitudes from night-to-night mean differences of all comparison stars plotted against spectral type of each programme star. Small circles indicate stars showing H α emission.

Visiting Astronomers

(April 1 – October 1, 1981)

Observing time has now been allocated for period 27 (April 1 – October 1, 1981). As usual, the demand for telescope time was much greater than the time actually available.

The following list gives the names of the visiting astronomers, by telescope and in chronological order. The complete list, with dates, equipment and programme titles, is available from ESO-Garching.

3.6 m Telescope

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|--------|---|
| April: | Surdej/Swings/Osmer, Schnur, Weigelt, Fitton, Fusi Pecci/Cacciari/Battistini/Buonanno/Corsi, Alcaino, Kohoutek. |
| May: | Kohoutek, Wehinger/Gehren/Wyckoff, Querci, F./Mauron/Perrin/Querci, M., Koornneef/Wester- |

lund, Glass, Eichendorf/Glass/Moorwood, Eichendorf, Moorwood/Salinari/Shaver, Moorwood/Salinari, Motch/Ilovaisky/Chevalier, Alcaïno, Valentijn, Westerlund/Richer.

June: Westerlund/Richer, Chevalier/Ilovaisky/Motch/Hurley/Niel/Vedrenne, Krautter/Reipurth, Westerlund, Wlérick/Cayatte/Bouchet, Vigroux/Comte/Lequeux/Stasinska, Gahm/Fischerström/Lindroos/Liseau, Persi/Ferrari-Toniolo/Grasdalen, Koornneef/Churchwell, Epchtein/Guibert/Nguyen Q-Rieu/Lepine/Braz, Sibille/Perrier/Léna/Foy, Bonneau/Foy.

July: Bonneau/Foy, Ardeberg/Nissen, Danks/Wamsteker, Engels, Martin/Emerson/Ruf/Wilson, Sherwood/Kreysa, Sherwood/Kreysa/Mezger, Fricke/Kollatschny/Yorke, Danziger/de Ruiter/Kunth/Lub/Griffith.

August: Danziger/de Ruiter/Kunth/Lub/Griffith, Pedersen/van Paradijs, Gyldenkerne/Axon/Taylor/Sanders/Atherton/Boksenberg, Danziger/D'Odorico/Goss/Boksenberg/Taylor, Danziger/Goss/Boksenberg/Fosbury/Axon/Taxlor, Bergeron/Boksenberg, Bergeron/Kunth/Boksenberg, Boksenberg/Danziger/Fosbury/Goss, Boksenberg/Ulrich.

September: Boksenberg/Ulrich, Lindblad/Boksenberg, Shaver, Shaver/Boksenberg, Ulrich/Boksenberg, Gillespie/Krügel/Thum, Chevalier/Ilovaisky/Motch/Hurley/Niel/Vedrenne, de Vegt, Macchetto/Perryman/di Serego Alighieri, Meisenheimer/Röser, Tarenghi/West, Wlérick/Cayatte/Bouchet, Véron, M.P. and P.

1.5 m Spectrographic Telescope

April: de Loore/Burger/van den Heuvel/van Paradijs, Richter/Huchtmeier, Richter/Materne/Huchtmeier, van Dessel, de Loore/Burger/van Dessel/van Paradijs, de Loore/Burger/van Dessel/van Paradijs, Ardeberg/Maurice, Lortet/Testor/Hydari-Malayeri, Ardeberg/Maurice.

May: Ardeberg/Maurice, Melnick/Quintana, Kohoutek, Kohoutek/Pauls, Breysacher/v. d. Hucht/Thé, Condal, Clegg/Greenberg, Krautter, Krautter/Reipurth, Piersma/Pottasch.

June: Piersma/Pottasch, Westerlund/Feinstein, de Vries/v. d. Wal, West/Kumsiachvili, Tarenghi.

July: Tarenghi, Barwig/Schoembs, Foy/Clavel/Bel, Ferlet, Ferlet/Bruston/Audouze/Laurent/Vidal-Madjar, Eichendorf, Drechsel/Rahe/Klare/Krautter/Wolf.

August: Drechsel/Rahe/Klare/Krautter/Wolf, Fricke/Kollatschny/Schleicher/Yorke, Bouchet, Ardeberg/Gustafsson, Lodén/Sundman, Pelat/Alloin, Spite, F. and M.

September: Spite, F. and M., Bouchet, Floquet/Paraggiana/Gerbaldi, Véron, P., Ferlet/Prévot, Macchetto/Perryman/di Serego Alighieri.

1 m Photometric Telescope

April: van Woerden/Danks, Alcaïno, Pedersen, Wesselius/Thé, de Jong/Thé/Willems/Habing, Wlérick/Cayatte/Bouchet, Battistini/Cacciari/Fusi Pecci, Wlérick/Cayatte/Bouchet, Battistini/Cacciari/Fusi Pecci.

May: Battistini/Cacciari/Fusi Pecci, Bastien, Glass/Moorwood, Bensammar, Moorwood/Salinari,

Moorwood/Salinari/Shaver, Motch/Ilovaisky/Chevalier.

June: Motch/Ilovaisky/Chevalier, Westerlund/Feinstein, Lub, Gahm/Fischerström/Lindroos/Liseau, Persi/Ferrari-T./Grasdalen, Epchtein/Guibert/Q-Rieu/Lepine/Braz, Epchtein/Gomez/Lortet, Bernard.

July: Bernard, Barwig/Schoembs, Engels, Steppe/Mezger, Bouchet, Martin/Emerson/Ruf/Wilson, Metz/Häfner.

August: Metz/Häfner, Chini, Bouchet, Heck, Gillespie/Krügel/Thum.

September: Gillespie/Krügel/Thum, Goudis/Hippelein/Münch, Hippelein/Melnick/Terlevich, Véron, M.P., Bouchet.

50 cm ESO Photometric Telescope

April: Bouchet, Lundström/Stenholm, Wesselius/Thé, Kohoutek/Knoechel, Motch.

May: Motch, Schneider/Maitzen, Schulte-Ladbeck.

June: Schulte-Ladbeck, Mauder, Bouchet.

July: Bouchet, Drechsel/Rahe/Klare/Krautter/Wolf, Metz/Häfner.

August: Metz/Häfner, Bouchet, Spite, F. and M., Lagerkvist/Rickman.

September: Lagerkvist/Rickman, Debehogne, Bouchet.

GPO 40 cm Astrograph

July: Lukas.

August: Lukas, Debehogne.

September: Debehogne.

1.5 m Danish Telescope

April: Weigelt, Veillet.

May: Motch/Ilovaisky/Chevalier, Lub.

June: Lub, Gahm/Fischerström/Lindroos/Liseau, Pedersen.

July: Pedersen, van Paradijs.

August: van Paradijs, Pedersen/van Paradijs.

September: Imbert/Prévot, Ardeberg.

50 cm Danish Telescope

September: Renson/Manfroid.

90 cm Dutch Telescope

April: Lub.

July: van Paradijs.

August: van Paradijs.

September: Isserstedt/Deubner.

61 cm Bochum Telescope

June: Bues/Rupprecht.

July: Bues/Rupprecht, Eichendorf, Schober.

August: Schober, Metz/Häfner.

September: Metz/Häfner.