Wilson's[4] F-G matrix method was used to evaluate the potential constants with a general quadratic potential function. When NH_2 is considered as a single mass point the problem reduces to the calculation of the vibrational modes for a molecule of six-body type. The molecule will have twelve fundamental modes with the distribution $5\ A_g + B_g + 4\ B_u + 2\ A_u$. The calculated frequencies of the nine planar modes are compared with the observed values in Table I. The main stretching force constants used are $f_{C-C} = 3 \cdot 5$ md/Å, $f_{C-N} = 7 \cdot 5$ md/Å and $f_{C=O} = 9 \cdot 7$ md/Å.

TABLE I

Observed and calculated frequencies (in cm.$^{-1}$)

Oxamide		Deuterated oxamide		
Observed	Calculated	Observed	Calculated	Assignment
1692* (Raman)	1719	..	1716	ν (CO) A_g
1493 ,,	1481	..	1469	ν (CN) ,,
800 ,,	820	..	800	ν (CC) ,,
448 ,,	436	..	426	ρ (OCN) ,,
357 ,,	378	..	366	δ (OCN) ,,
1660 (Infra-red)	1667	1652	1663	ν (CO) B_u
1345 ,,	1327	1370	1299	ν (CN) ,,
640 ,,	640	625	625	δ (OCN) ,,
..	230	..	224	ρ (OCN) ,,

* Raman frequencies.

From a study of the potential energy distribution among the symmetry co-ordinates it was possible to assign the two lower fundamentals with certainty. They are the 357 cm.$^{-1}$ and 448 cm.$^{-1}$ bands observed in Raman spectrum which have been assigned to the δ(OCN) bending and ρ(OCN) rocking modes of the type A_g respectively. Scott and Wagner have assigned the band at 640 cm^{-1} to the (OCN) bending mode of the type B_u and the corresponding mode in deuterated oxamide as 569 cm.[1] The calculated value for the deuterated oxamide is found to be 625 cm.$^{-1}$ The band observed at 625 cm.$^{-1}$ is assigned to this mode and the 569 cm.$^{-1}$ band to the ND_2 wagging mode which corresponds to the 792 cm.$^{-1}$ of the undeuterated species.

From Table I, it is seen that the C–N frequency increases on deuteration. Scott and Wagner have attributed this effect to the different amount of coupling between the NH_2 bending and C–N stretching modes as compared to the coupling between ND_2 bending and C–N stretching modes of the deuterated species. This could be tested by treating the molecule as a ten-body problem to evaluate the potential energy distribution. This work is in progress and would be published in due course.

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STUDIES ON DRIFTS IN THE E REGION AT WALTAIR

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I. VARIATION OF DRIFT SPEED AND DIRECTION WITH HEIGHT

NOT much work has been reported on the height variation of drift speed and direction at low latitudes. The present investigation has therefore been undertaken using the data of drift speeds and directions obtained on 2·0 Mc./sec. at different virtual heights in the ionosphere by the similar fades analysis of spaced fading records due to Mitra.[1] Theoretical investigations by Booker[2] and experimental studies by Jones[3] provide the justification for assuming that the level corresponding to the drift is close to the reflection level of the radio-waves.

For the evaluation of height gradients, drift speeds and drift directions obtained during 1962-64 for virtual heights ranging between 100–110, 110–120, 120–130 and 130–140 km. are grouped and the average values of drift speed and direction in each of these ranges are presented in Table I along with the height gradients. It can be seen from the table, that the height gradient of drift speed, which is positive and fairly constant, has an average value of 0·59 m./sec./km. in the entire height range of 100–140 km. in E region. The drift direction is negative (*i.e.*, rotating in an anticlockwise sense with increase of height) in the height range of 100–120 km. and positive in the remaining height ranges.

TABLE I

Variation of average values of drift speed and direction with height

Height range in km.	Average height (km.)	Average value of		Height gradient of	
		Drift speed (m./sec)	Drift direction (E of N)	Drift speed (m./sec./km.)	Drift direction (degrees/km.)
100–110	105	66·4	158°		
				0·62	−0·76
110–120	115	72·6	150·4°		
				0·54	0·22
120–130	125	78·0	152·6°		
				0·62	0·86
130–140	135	84·2	161·2°		

The value of height gradient of drift speed obtained in the present investigation is much less than that reported from high latitudes by Elford and Robertson[4] and Greenhow[5] who estimated height gradient of drifts using meteor trails. As the observations in the present investigation refer to higher levels in the E region for a low latitude station, complete agreement need not be expected. Rao and Rao[6] and Rao and Rao[7] reported the height gradients of drift speed of 0·74 and 0·72 m./sec./km. at Waltair for the periods 1957–59 and 1960–62 respectively, values which are higher than that obtained in the present study which covers the period 1962–64. Considering the results of height gradient for the three periods referred to above, we arrive at the interesting and new result that the height gradient of drift speed decreases with sunspot activity.

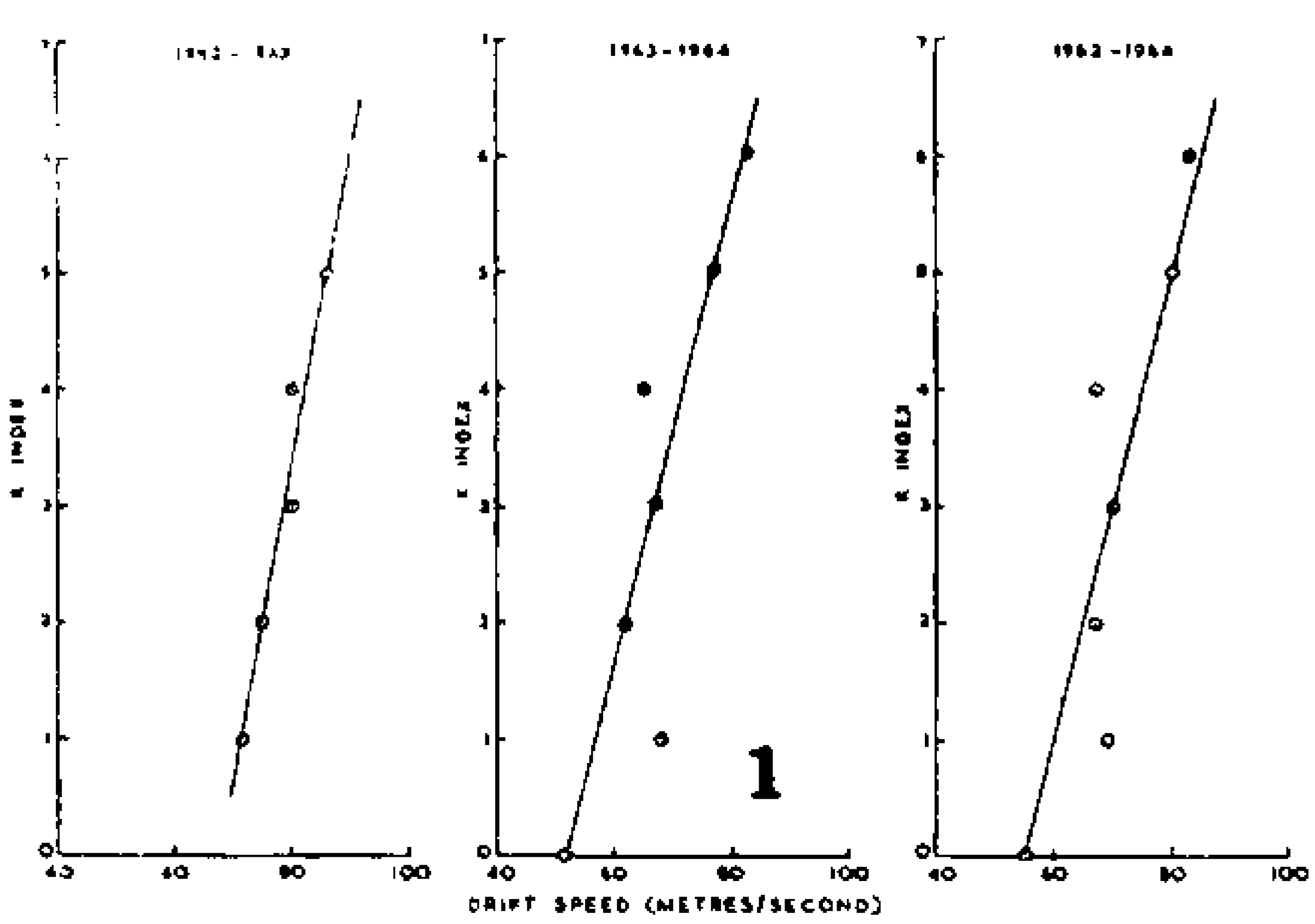
The observed rotation of the drift vector, with height in an anticlockwise sense in the height range of 100–120 km., agrees well with a similar result obtained by Manring *et al.*[8] by sodium vapour trail method. As height variation of drift direction has not been studied at low latitudes by similar fades method, no such comparison could be made with the results of the present investigation.

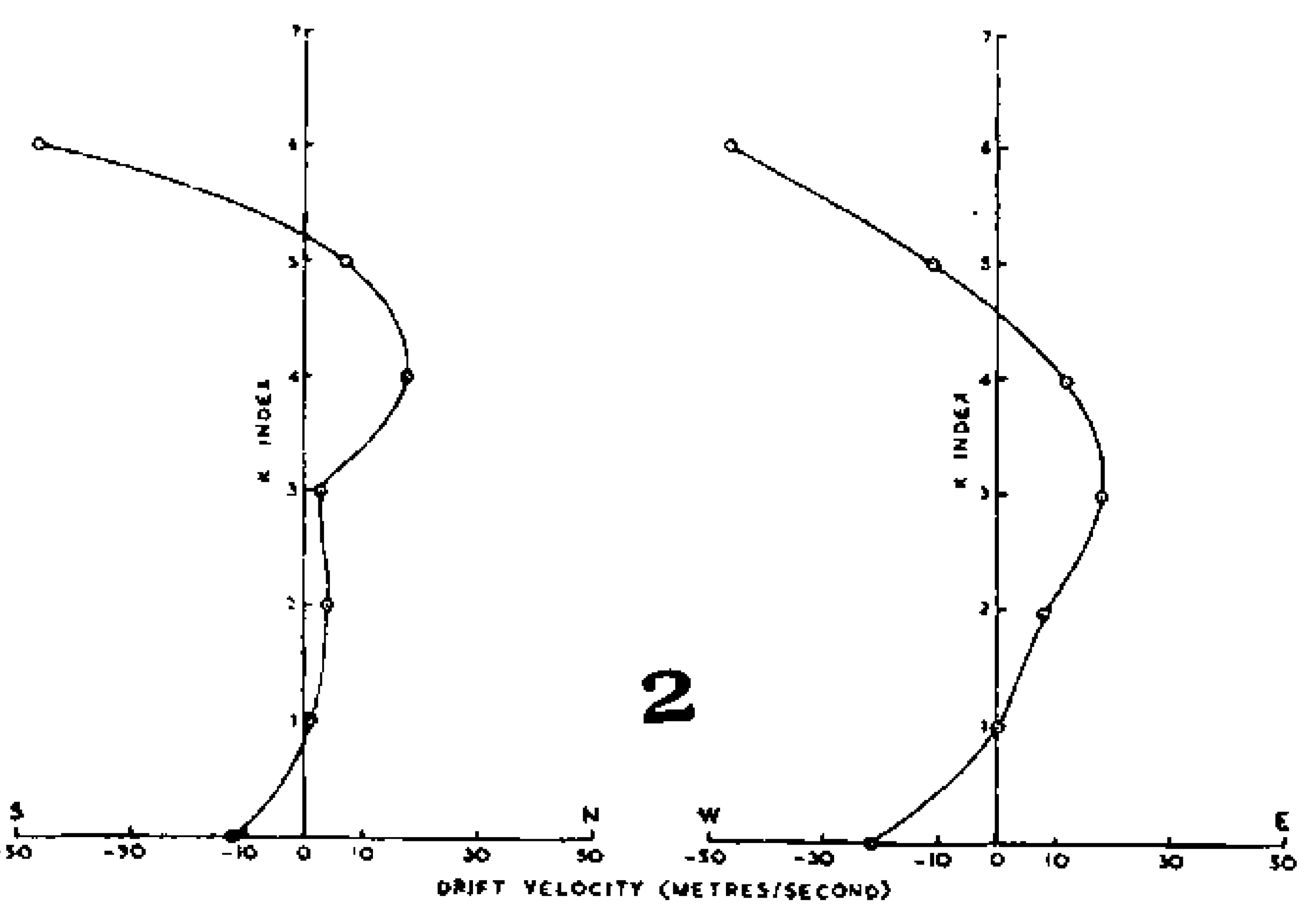
II. Effect of Magnetic Activity on Horizontal Drifts

The study of the effect of magnetic activity on horizontal drifts in the E region is relevant for a complete understanding of the origin of drifts. In view of the importance of this study, the drift data (obtained by similar fades analysis) for the E region taken on 2·0 Mc./sec. by spaced receiver method for the period 1962-64 at Waltair (17° 43′ N., 83° 18′ E.; Geo. Mag. Lat. 7·4° N.) is divided into three-hour groupings corresponding to the magnetic K index data of Alibag (Geo. Mag. Lat. 9·5° N.) which provides only one K index for every three-hour interval commencing from 0000 hrs. G.M.T.

The average value of drift speed for each of these three-hour periods is taken as the representative drift speed of the corresponding K index. The values of drift speeds corresponding to each particular value of K index were averaged for the periods 1962-63, 1963-64 and 1962-64 separately and the variation of this average drift speed with K index for the above periods is presented in Fig. 1. It can be seen from the plots that positive correlation exists between the E region drift speed and magnetic activity throughout the period 1962-64. The slopes of the straight lines in Fig. 1 are almost equal and the change of drift speed for unit change of K index in the present investigation came out to be 5 m./sec. In order to study the variation of NS and EW components of drift velocity with K index, all the drift speeds obtained during the present investigation were resolved into NS and EW components. The average values of NS and EW components for each value of K index were calculated taking the sign into consideration. The variations of the average values of NS and EW components with K index for 1962-64 are presented in Fig. 2. From a perusal of Fig. 2, it can be concluded that the variations of NS and EW components with K index are similar except for minor changes. It will be observed that the NS component is towards south for K indices less than 1 and greater than 5 and north for the remaining K index values. On the other hand, the EW component was found to be towards west for K indices less than 1 and greater than 4 and towards east in the remaining K indices.

Results of similar investigation are not available for any low latitude station other than Waltair. However, it is interesting to note that investigations at high latitudes by Chapman[9] and Briggs and Spencer[10] did not reveal any systematic variation of total drift speed or NS or EW components with magnetic activity upto K index of 5. For higher K values they found positive correlation between E region drift speed and magnetic activity. Utilising the data for the period 1960-62, Rao and Rao[11] studied the effect of magnetic activity on E region drift speed and obtained a value of 2·3 m./sec./unit change of K index. The value of 5 m./sec./unit change of K index obtained in the present study is much higher and this may be due to the fact that the period under study is of low sunspot activity compared to the period 1960-62.





FIGS. 1-2. Fig. 1. Variation of E Region drift speed with magnetic K index for different periods. Fig. 2. Variation of NS and EW components of drift velocity with magnetic K index in the E region.

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MEIOTIC BEHAVIOUR OF ABERRANT HYPOPLOID MICROSPOROCYTES IN *TRITICUM ZHUKOVSKYI* Men. *et* Er.

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EXPERIMENTAL evidence was presented by Upadhya and Swaminathan[3,4] to show that *T. zhukovskyi*, a new hexaploid wheat, arose as an amphidiploid from the cross between *T. timopheevi* and *T. monococcum* and has the genomic constitution AAAABB.

During the course of meiotic studies in *T. zhukovskyi* in one of the anthers microsporocytes were observed which had aneuploid chromosome complements along with cells having $2n = 42$ chromosomes. Fourteen cells out of 16 were at the first meiotic metaphase and the rest two at the first anaphase. The two cells found at the first anaphase had 21 chromosomes each. In one of the cells 8 and 6 chromosomes were at either poles while 7 were at the equatorial region, whereas in the second cell 9 and 7 chromosomes were at the poles and 5 at the equatorial region. The data on the meiotic behaviour of the fourteen cells are given in Table I.

It will be observed from Table I that the cells show, apart from bivalents and univalents, higher associations of chromosomes forming tri-, quadri-, penta-, hexa- and heptavalents. The frequency of trivalents and quadrivalents is the