

Discussion of short communications on miscellaneous subjects

Communication of SCOTT BLAIR.

Comments VAN WIJK: Does one have any idea about the chemical nature of the linking groups of the molecules that are responsible for the „Spinnbarkeit“?

Reply SCOTT BLAIR: In reply to Prof. VAN WIJK. The mucus is undoubtedly a mixture or, better, compound of protein and polysaccharide. The Spinnbarkeit and flow-elasticity associated with oestrus are probably dependent on the latter, since the secretion contains very little protein at oestrus. I must stress the point that all this work except the rheology, is at a very early stage and that we know very little yet about the fundamental constitution of the mucus.

I particularly welcome Mr. VAN STRALEN's paper, since in my own laboratory, we have started measurements, using the hot wire method of heat conductivity in rather thick creams.

Communications of HOLMES and of MORTIER—DE BOODT.

Comments DE BOODT: Dr. DE BOODT is in favour of Indium as an acceptor for neutrons on account of its smaller size.

Reply HOLMES: Dr. HOLMES prefers boron trifluoride as a more efficient acceptor for slow neutrons.

Comments PENMAN: VAN BAVEL's experience in North Carolina is that the volume sampled in a wet soil is smaller than in a dry soil owing to absorption of neutrons. This introduces an uncertainty in the determination of water content.

Reply HOLMES: In an infinite soil you are not losing neutrons.

Reply MORTIER: We have made experiments using slabs of concrete, water, air and sands. When the slab was 20 cm thick it could be considered as practically infinite. Applying a reflector of paraffin wax above the counter did not affect the relative determination of moisture content although of course the readings were influenced.

Comments SLATYER: Is it possible to use the same hole for repeated measurements, say in course of a year or is it essential that a great number of holes must be drilled, which disturbs the soil?

Reply MORTIER: Several holes must be drilled but the soil is much less disturbed than e.g. with sampling according to the boring method.

Communication of RENTSCHLER: Gipsblockmethode.

Comments VAN WIJK: 1. Beziehen sich die Registrierungen der Feuchteänderungen auf bewachsenem oder auf unbewachsenem Boden?

2. Wie verhält sich der Gipsblock auf die Dauer unter bewachsenem Boden?

Reply RENTSCHLER: In unbewachsenem Boden. Wir wollen aber im nächsten Jahr Messungen mit einem 12 Punktschreiber (6 Messtellen unter unbewachsenem und 6 Messtellen unter bewachsenem Boden) anstellen.

Comments WOLFF: BOYOUOUS blocks and Fibreglass blocks (COLEMAN) have been used in irrigation experiments in Israël and have not given satisfactory

results or the desired accuracy. We have found them suitable only for approximate indications when to take samples for determination by the gravimetric method. The BOYOUOUS blocks were made in Israël.

Reply RENTSCHLER: Dass in der Nähe der Sättigung des Bodens die Schwierigkeiten besonders gross sind und ein beliebiger Messblock bei grossem Wassergehalt zuerst versagt, ist uns auch bekannt. Man muss bestrebt sein einem Messblock zu finden der zum Boden passt.

Comments MÄDE: Es wird auf die Anpassung des Gipsblocks als Testkörper an den umgebenden Boden hingewiesen. Hier spielen die Hygroskopizität und vielleicht auch seine chemischen Eigenschaften eine wesentliche Rolle.

Reply RENTSCHLER: Beste Resultate haben wir bekommen mit einem Block der aus Hohenheimer Boden plus etwa 20 % Gips bestand und der deshalb dem Boden angepasst war.

Comments SCHOFIELD: Draws attention to the fact that one should expect greater consistency with the Gypsum blocks on measuring the conductivity of a saturated calcium sulfate solution and therefore the determination does not depend so highly on the concentration of the soil constitution as with Nylon Blocks. Actually Dr. SCHOFIELD does not understand how Nylon Blocks can be used at all. A difficulty with both types of blocks remains the contact with the electrodes.

Reply RENTSCHLER: Wir haben auch festgestellt, dass die Anzeige der Nylonblöcke sehr von der Bodenlösung abhängt.

Comments RAMSAUER: In Patzenkirchen erfolgt die Eichung in Böden die mit grossen Stechzylindern (1000 cm³) in natürlicher Lagerung entnommen werden und der in der Natur zu erwartenden Feuchtigkeit ausgesetzt. Die Bodenproben sind dem Feld entnommen in dem die Registrierungen erfolgen.

Reply RENTSCHLER: Die Eichung der Messblöcke ist wohl eines der schwierigsten Probleme bei der beschriebenen Methode. Wir eichen im Laboratorium in ähnlicher Weise wie erwähnt und darüber hinaus in kleinen wägbaren Lysimetern (ca. 10 x 10 x 5 cm). Die im Vortrag erwähnten Eichungen wurden unter Feldbedingungen, durch Vergleich von ca. 600 Messungen mit der Gipsblockmethode mit solchen nach der Wägenmethode durchgeführt.

Comments SLATYER: It is virtually impossible to make sweeping generalisations about the suitability and otherwise of gypsum blocks as indications of soil moisture tension and soil moisture content. I think Australian experience has indicated that they can be very satisfactory if used on the drying cycle and between 0.5 and 15 atm. tension. In dryland monsoon agriculture, for instance, they have been very satisfactory, but in irrigation agriculture, most unsatisfactory.

Reply RENTSCHLER: Ich bin der Meinung, dass es möglich ist für die meisten Bodenverhältnisse Messblöcke herzustellen deren „Saugkraft“ dem zu untersuchenden Boden so weitgehend angepasst ist, dass die Anwendung der Methode möglich ist ¹⁾.

¹⁾ Wir in Hohenheim machen diese Anpassung durch Beimengung von Boden oder Sand zu den Gipsblöcken oder aufer auch durch Benützung verschieden poröser Blöcke.

Communication of SESTOFT.

Comments LEVI : Was the influence of vertical water-vapour distribution as a contributing factor to freezing temperatures taken into account and how was this difficulty in forecasting resolved ?

Reply SESTOFT : In the spring when frost forecasting is most important one has few inversions in Denmark and it is, therefore, thought that an abnormal water vapour distribution will seldom occur.

Comments STANHILL : Is the equation empirical ?

Reply SESTOFT : Yes, it is necessary that the variables used are mutually independent.

Comments COVENTRY : Work on frost prediction in southern Rhodesia has shown the difficulty of correlating frost occurrence with any single temperature, whether screen minimum or grass minimum, even after the frost has occurred. Does Dr. SESTOFT's formula relate to screen minima only, or would he suggest that different types of temperature such as grass minima might be more appropriate in some areas ?

Reply SESTOFT : So far only screen temperature has been taken into account, but in the future temperatures closer to the ground should be taken into account.

Communication of RENTSCHLER : Grossberegnungsanlage.

Comments BUSINGER : Wie stark ist die Niederschlagintensität bei der Grossberegnungsanlage ?

Reply RENTSCHLER : Sie war 2 mm pro Stunde.

Comments RAMSAUER : Weist darauf hin, dass in Auer bei Bozen in Südtirol eine Grossberegnungsanlage für ca. 80 ha besteht.

Reply RENTSCHLER : Die Anlage im Kochertal ist die grösste geschlossene Frostberegnungsanlage in West-Deutschland.

Comments WOUDEBERG : In welcher Höhe haben Sie die Temperaturmessungen gemacht ?

Reply RENTSCHLER : Die Instrumente waren in 50 cm Höhe ungeschützt zwischen den Rebereihen aufgestellt.

Communication of BOEKEL—PEERLKAMP.

Comments KOENIGS : What do you think is the reason that deterioration of soil structure increases its retention of water at pF 1.9 ?

Reply PEERLKAMP : It is due to a change in the pore size distribution. The mean pore size is becoming smaller and this results in a higher moisture percentage at pF 1.9.

Comments RAMSAUER : Ich frage mich ab, ob bei Durchführung der Maulwurfdränung die Konsistenzgrenzen beachtet werden, bzw. ob die Konsistenzgrenzen zur Beurteilung der Notwendigkeit der Maulwurfdränung verwendet werden.

Reply PEERLKAMP : So weit ich weiss werden die Konsistenzgrenzen dazu in unserem Lande nicht verwendet.

Comments PENMAN: a) What aspect of soil structure is Dr. PEERLKAMP interested in, i.e. what is the soil property of agronomic significance that he is trying to express numerically?

b) Has he tried the technique of Dr. CHILDS?

Reply PEERLKAMP: a) We have the intention to learn something about the stability of clay soils. That means, we try to describe numerically the destruction of a clay soil during winter after the ploughing in autumn.

b) No, till now, we did not apply those techniques.

Comments CHILDS: a) Does Dr. PEERLKAMP's paper refer to the structure of topsoil or of subsoil?

b) Is it not possible that the approach of the moisture content at pF 1.9 to the lower plasticity limit in soils of good structure is due to an increase of the latter consequent upon the well-drained structured soils having the superior organic matter content?

Reply PEERLKAMP: a) Mainly to topsoil.

b) As was shown by Fig. 1 an improvement of soil structure generally goes parallel with an increase of the lower plastic limit and a decrease of the moisture percentage at pF 1.9. This occurs not only after organic dressings (Fig. 1 bottom), but also on one and the same soil after a treatment with lime, gypsum or a soil conditioner. Therefore it seems not always related to a higher organic matter content.

Communication of ERNST.

Comments CHILDS: I would like to ask the author whether the soil heterogeneity with which he deals consists of uniformly thick plane parallel strata. If so, this would appear to be at least as unlikely to exist in nature as complete uniformity of soil.

Reply ERNST: The application of the method is dependent upon the possibility of reducing the soil profile to a certain number of horizontal layers.

It is possible as well to take in account some horizontal discontinuities. Considering every open waterway also as a kind of discontinuity in the horizontal sense, the number of equations will be approximately equal to the product of the horizontal and the vertical discontinuities.

During our investigations on sandy soil in the south-eastern part of the Netherlands and on river level and basic clay soil along the Kromme Rijn full attention was paid to the discussed heterogeneities. We got the impression that it will presumably be more difficult to get sufficient information about the location of these heterogeneities and about the magnitude of the permeabilities than to solve a rather large number of linear equations.

Communication of RENTSCHLER: Witterung und Kornabtrocknung auf dem Halm.

Comments MÄDE: Hinweis auf Tauregistrierungen im mitteldeutschen Trockengebiet, die die Einsatzmöglichkeit des Mähdeschers im Laufe des Tages abschätzen lassen.

Comments PEERLKAMP: Ist die Kornfeuchtigkeit auf elektrischem Wege ge-

messen? Können Sie ganz kurz angeben, wie das vor sich geht? Waren es Kapazitätsmessungen? War die Packung reproduzierbar gemacht und wie?

Reply RENTSCHLER: Es handelte sich um Messungen der elektrischen Leitfähigkeit zerquetschter Körner, die bei der Messung unter reproduzierbarem Druck standen. (Leitfähigkeitsmessgerät „Auquapart“ der Fa. KÜHNE, Frankfurt/Main).

Communication of DE VRIES and STERK.

Comments CHILDS: Dr. DE VRIES has assumed a sinusoidal forcing frequency of period 24 hrs. This is not true unless the temperature wave has true sinusoidal form for very many consecutive periods; even in climates of very regular diurnal wave form, as in Egypt or India, this wave form is not truly sinusoidal and in European climates the irregularity may be extreme, so that a 24 hour periodicity may hardly be detected. How far does this invalidate the analysis which Dr. DE VRIES has presented?

Reply DE VRIES: The hypothetical examples represented here are based on the assumption of a simple harmonic variation of temperature at the surface and the conclusions are therefore independent of the true periodicity of the experimental data.

Concerning the latter question it can be said that calculations made by Professor VAN WIJK and the author have shown that in most cases the non-periodicity, caused by the fact that the temperature of a day differs from that of the previous day, does not affect the first harmonic in the Fourier analysis appreciably.

Comments MONTEITH: What was the environment of the site where Mr. STERK's temperatures were obtained? Was the assumption $z = 1$ cm justifiable for the vegetation in all stages of growth and how critical is the value of z_0 in the calculation.

Reply STERK: The measurements were carried out at the experimental site of the Laboratory of physics and meteorology at Wageningen. The calculations were made using different values of z_0 ($z_0 = 0.1$, $z_0 = 1.0$ and $z_0 = 3.0$) and the influence on the temperature at 10 cm is small.

Comments MONTEITH: Wouldn't you expect eddies generated by the buildings to interfere rather seriously with the form of the temperature profile?

Reply DE VRIES: Yes, indeed. The theoretical results were applied to the experimental data at hand, but the site is far from ideal for measurements of this type and if the subject is investigated further a better site must be found.

Comments VAN WIJK: It follows from Dr. DE VRIES' and Mr. STERK's work that in case of a heat conductivity varying as z^a with height, even a variation with a factor 1000 of the heat conductivity does not correspond to an abnormal ratio in the temperature amplitudes at 200 cm and 10 cm. So it is very dangerous to derive heat transfer from temperature measurements unless the temperature is read at many heights.

Comments PENMAN: With my colleague Dr. McCULLOCH at Rothamsted I have made a computation of thermal diffusivity in soil. This combines the

amplitude ratio method and the phase lag method, and the final equation is identical with that of Dr. PEERLKAMP. The two standard methods do not give the same answer, neither in our experiments nor in any others we have studied, because the diffusivity varies very rapidly with depth.

Out of the analysis it is possible to get expressions for $(\rho c)/(\rho c)_0$ where ρc is the heat capacity per unit volume, $(\rho c)_0$ is the value at an arbitrary depth, which can be the surface.

Reply DE VRIES: ALBRECHT ²⁾ has proposed to determine soil moisture content by simultaneous measurement of the thermal diffusivity and the thermal conductivity of the soil. I have been rather critical about the applicability of this method, as I felt that it would not be possible to determine both quantities with sufficient accuracy. I am very interested to hear that Dr. PENMAN has obtained satisfactory results by this method.

²⁾ ALBRECHT, *Arch. f. Met. Geophys. und Bioklim.*, Serie B 1 (1949) 149–150.