# PROCEEDINGS OF THE WORKSHOP

# ON THE

# NIGERIAN MICROMETEOROLOGICAL EXPERIMENT (NIMEX-1)

**July 15, 2004 at Ile-Ife, Nigeria**

Edited by
**O. O. Jegede**
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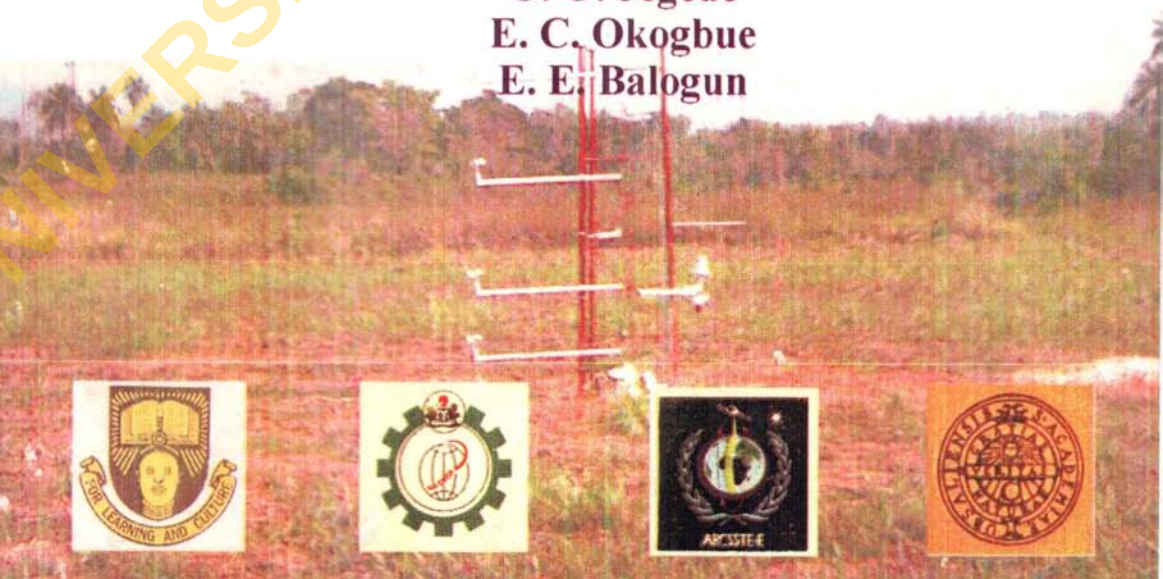

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# NIGERIAN MICROMETEOROLOGICAL EXPERIMENT (NIMEX-1)

**THEME:** BASIS, EXPERIMENTATION AND THE PRELIMINARY RESULTS

**Organisers**
**The Atmospheric Research Group (ARG)**
(Obafemi Awolowo University, Ile-Ife, University of Ibadan, Ibadan and The Federal University of Technology, Akure)

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**Date**
July 15, 2004

**Editors**
O. O. Jegede
E. C. Okogbue
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III.3 Soil Thermal Properties at the NIMEX-1 Site

**(O.R. Oladosu, M.A. Ayoola, E.F. Nymphas, M.O. Adeniyi, G.I. Olatona** and **L. A. Sunmonu)**

In Figure (III.8) is shown the diurnal cycle of the soil temperatures for three depths (0.02, 0.10, 0.30m) from four selected days (Julian days 55 to 58) within NIMEX-1 observation period. It can be observed that the temperature wave is sinusoidal in nature and that the wave amplitude decreased (i.e. damping) deeper into the soil layer. Furthermore, there was appreciable lag between the times of occurrences of the temperature maximum between the consecutive soil levels.

Particularly, on day 55, the maximum wave amplitudes at 0.02m, 0.10m, 0.30m depths, which were 42°C, 38 °C and 34 °C respectively, occurred at 16:00 hrs, 17.30hrs and 21:00hrs. But on the day 56, the maximum wave amplitude for the same three depths occurred later at 17:00hrs, 18:00hrs and 21:30hrs, which is significant when compared with the times of maxima of the previous day. This is attributed to the increased soil wetness caused by a heavy rainfall in the night of day 55 (about 8.00p.m.). The maximum temperature wave amplitude for day 57 was lower than that of the previous; it was 35°C at 0.02m depth and about 33°C at 0.10m depth. This is due to the fact that most of the solar heating received at the surface was used in

**Table III.1: Soil thermal diffusivity and moisture content during NIMEX-1.**

| Julian Day No. | Damping depth (m) | Thermal Diffusivity ($\alpha_H$) x $10^{-6}$ $m^2s^{-1}$ | Soil water content (%) |
|---|---|---|---|
| 55 | 0.15 | 0.82 | 4.7 |
| 56 | 0.13 | 0.61 | 7.2 |
| 57 | 0.18 | 1.17 | 14.3 |
| 58 | 0.15 | 0.82 | 16.1 |
| 59 | 0.13 | 0.61 | 14.0 |
| 60 | 0.15 | 0.82 | 13.4 |
| 61 | 0.13 | 0.61 | 13.8 |
| 62 | 0.14 | 0.71 | 12.4 |
| 63 | 0.15 | 0.82 | 11.4 |
| 64 | 0.17 | 1.05 | 10.4 |
| 65 | 0.17 | 1.05 | 9.6 |
| 66 | 0.16 | 0.93 | 8.9 |
| 67 | 0.16 | 0.93 | 8.3 |
| 68 | 0.15 | 0.82 | 7.9 |
| 69 | 0.14 | 0.71 | 7.5 |

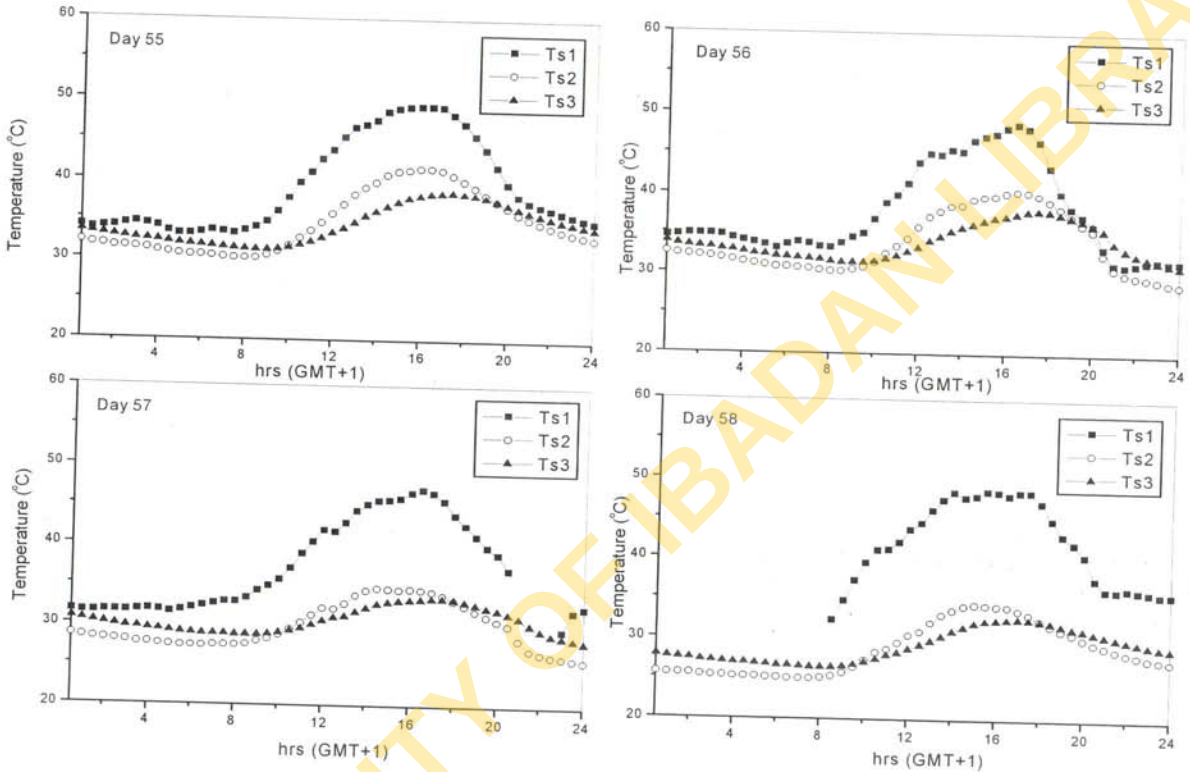


Fig. III.8: Diurnal variation of soil temperature at 2cm, 10cm and 30cm.

evaporation of moisture in the soil (the latent heat was negative). On day 58, the maximum wave amplitude at 0.02m, 0.10m and 0.30m depths were 35°C, 33°C and 31°C respectively (and times of their occurrences being at 15:00hrs, 17.30hrs and 21:00hrs). These values were also lower when compared with those of day 55, which, was for a relatively dry day.

The Table III.1 above shows estimated soil thermal diffusivity with the degree of soil wetness in (% of volume) recorded during a selected period of NIMEX-1 study. The thermal diffusivity values obtained were from use of Eq. (I.51).

## III.4. Sensible and Latent Heat Fluxes during NIMEX-1 (**M. Mauder**, **M. Göckede** and **T. Foken**)

Turbulent fluxes of sensible and latent heat during NIMEX-1 for the period from March 1st until March 9th 2004 are shown in Figure (III.9). During the first three days of this period the turbulence measurements were interrupted at nights. Data are usually available from 07:00 h to 17:00 h. Latent heat fluxes are as high as almost 300 W/m² in maximum around noon. Whereas sensible heat fluxes reach maximum values between 100 W/m² and 200 W/m². From March 4th on the data acquisition was running uninterruptedly.

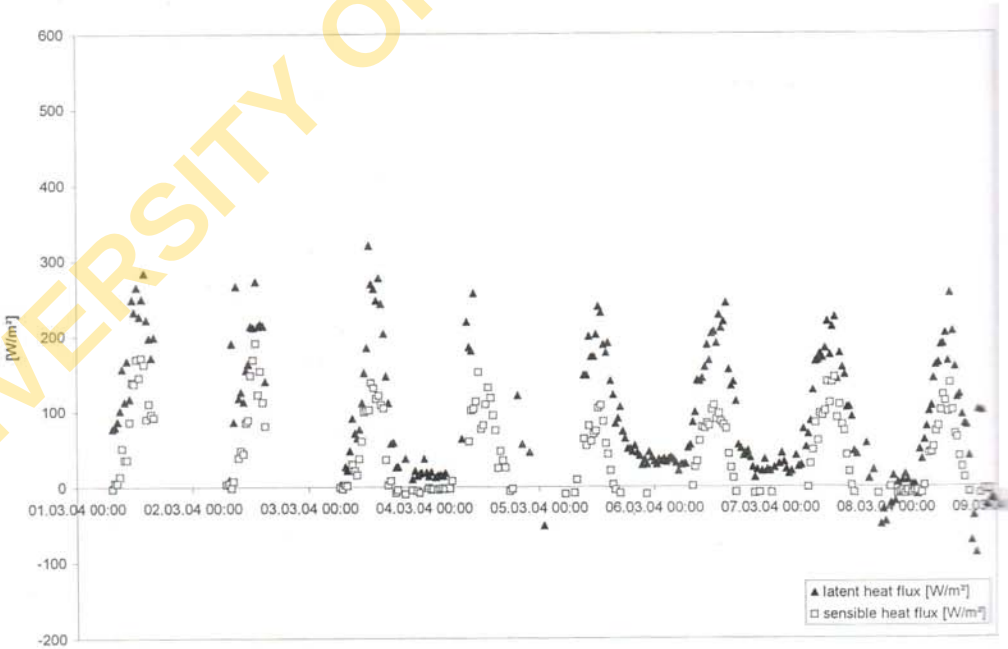


Figure III.9: Turbulent fluxes of sensible and latent heat during NIMEX-1 for a selected period March 1st until March 9th 2004, for QC Flag classes: 1 – 6.