

# 第40回北海道高等学校数学コンテスト

会場：各学校

標準実施日時：1月8日(土)9:00~12:30

(学校により日時が異なる場合がありますので担当の先生に確認してください)

参加対象：道内の中・高生

受験料：無料

表彰ほか：成績上位者(20名程度)を表彰

ウェブサイトでの発表

数学関連の研究会、出版物等での紹介

結果：2月下旬に学校を通して本人に通知

申込方法：所属学校の数学の先生を通じて

詳細についてはHPから→



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In the actual computation, convective equilibrium is computed as an asymptotic state of an initial value problem. The procedure are described in Appendix 1. The result of the marching computation is shown in Fig. 2. In this figure  $e_s(T)$  denotes the saturation vapor pressure of water vapor as a function of temperature.  $h$  denotes the relative humidity.  $\tau$  denotes the number of the time steps of numerical integration, and  $l$  is the indexing of the finite differences in the vertical direction. (Refer to Appendix 3 for the illustration of levels adopted for vertical differencing.) The exact definitions of mean emissivity and mean absorptivity are also given in M.S., pp. 365-366.

Since the changes of absolute humidity correspond to the change of air temperature, the equivalent heat capacity of moist air with relative humidity  $h$  may be defined as

$$C_p' = C_p \left[ 1 + \frac{L}{C_p} \frac{\partial}{\partial T} \left( \frac{0.622 h e_s(T)}{p - h e_s(T)} \right) \right], \quad (1)$$

where  $L$  and  $C_p$  are the latent heat of evaporation and the specific heat of air under constant pressure, respectively. The second term in the bracket appears due to the change of latent energy of the air.

The reader should refer to M.S. for the following information.

- 1) Computation of the flux of long-wave radiation.
- 2) Computation of the depletion of solar radiation.
- 3) Determination of mean absorptivity and emissivity.

We have therefore assumed that the minimum value of mixing ratio  $r_{\min}$  to be  $3 \times 10^{-6} \text{ gm gm}^{-1}$  of air, i.e., if

$$l = 0.622 h e_s(T) \backslash$$

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The vertical distribution of ozone which is used for the computation is shown in Fig. 4. This data is obtained by Herring and Borden (1965) using chemiluminescent ozonesondes for the period September

Experiment no.			Low
C1	0.218 (FB)	0.000 (FB)	0.306 (FB)
C2	0.218 (FB)	0.500 (FB)	0.306 (FB)
C3	0.218 (FB)	1.000 (FB)	0.306 (FB)
C4	1.000 (FB)	0.072 (FB)	0.306 (FB)
C5	0.218 (FB)	0.000 (FB)	0.306 (FB)
C6	0.218 (FB)	0.072 (FB)	0.306 (FB)
C7	0.218 (FB)	0.072 (FB)	0.306 (FB)
C8	0.218 (FB)	0.072 (FB)	0.306 (FB)
C9	0.218 (FB)	0.072 (FB)	0.306 (FB)
C10	0.218 (FB)	0.072 (FB)	0.306 (FB)
C11	0.218 (FB)	0.072 (FB)	0.306 (FB)
C12	0.000 (FB)	0.000 (FB)	0.000 (FB)
C13	0.218 (FB)	0.072 (FB)	0.306 (FB)

13C, which was obtained for the atmosphere fixed absolute humidity (see M.S.). The distribution of equilibrium temperature of the earth's surface, the amount of low ( $C_L$ ), middle ( $C_M$ ), and high clouds may be expressed by the following equation

$$\frac{\partial T^*}{\partial (100C_L)} = -8.2$$

$$\frac{\partial T^*}{\partial (100C_M)} = -3.9$$

主催：北海道算数数学教育会高等学校部会

後援：北海道教育委員会 札幌市教育委員会 北海道高等学校長協会  
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