RADIATION BALANCE AND MICROCLIMATIC FEATURES OF MARSH IN THE SANJIANG PLAIN

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ABSTRACT: Radiation balance, soil temperature and the temperature and humidity of air were measured in marshes and reclaimed farmlands of the Sanjiang Plain. Soil-heat flux was calculated with two different methods. Through the analysis of a lot of data, the daily variations and the law of vertical distribution of microclimate factors on marsh surface was obtained. It is found that after marshes are reclaimed, radiation balance increases, both soil temperature at different depths and air temperature of various height near ground layer rise, and air humidity decreases obviously. Therefore, one should take the establishment of artificial ecosystem of growing paddy and reed and breeding fish as the main development direction of marshes, at the same time, protect some marshes in order to prevent the environment from getting dry, and maintain regional ecological balance.

KEY WORDS: marsh, radiation balance, microclimate, soil-heat flux

The Sanjiang Plain is located in northeast China. It includes the low plain formed by the alluviation of the Songhua River and the Wusuli River to the north of the Wanda Mountain, and the plain formed by alluviation and lacustrine action of the Wusuli River and Xingkai Lake and some hilly lands to the south of Wanda Mountain. It covers an area of 163,330,00 mu (1 mu = 1/15 ha). It is the important commodity grain base. But within this region many marshes are formed and spread all over the low-lying lands which are on the flood land, the lake side and the terrace because of low and flat topography, sticky and heavy soil, impeded drainage, and much rainfall in summer and autumn. There are now 167,890,000 mu of marshes altogether in this region according to the multi-spectrum satellite image analysis and the practical investigations. It is the largest region filled with marshes in China.

Since 1983 we successively made a series of continuous microclimate observations day
and night on the reclaimed farmland and the typical marsh land (thickness of peat layer was 40cm, *Carex lasiocarpa, Deyeuxia angustifolia* and *Equisetum heleocharis* grew, the height of grass 60 cm, the cover degree was 90% and the soil was over wet) near the Raoli River—the Wusuli River branch three times in order to use and protect marshes better and learn about the change pattern of natural environment after marsh reclamation. Finally we got many valuable data, on the basis of these data, radiation of marsh land, soil climate and the basic characteristics of air temperature and air humidity near ground layer were analyzed and the proposals relevant to the development and utilization of marshes were put forward.

I. RADIATION ON MARSH SURFACE

Radiation balance (*B*) is the difference between the solar short wave radiation on ground surface and effective radiation; namely,

\[ B = Q(1 - A) - F \]

where, *Q* is the total radiation, *A* is the reflectivity of ground surface.

Radiation balance is the basic element that determines the change of air layer near ground layer, soil climate and land productive potentialities. There have not been any practical observation materials of the radiation balance of marsh surface in China. In order to learn about the change pattern we use net radiation meter and reflectometer in the observations.

As a result, in the marsh land covered with dense *Carex lasiocarpa* and *Deyeuxia angustifolia* vegetation the radiation balance has an obviously daily variation, which is as the same as the other layers (Table 1). During the day time, the solar radiation volume absorbed by the marsh surface was more than the effective radiation and the radiation balance was a positive value. Because the increasing speed of the radiation as the height of the sun rose was far more than the effective radiation, the radiation balance value got larger

<table>
<thead>
<tr>
<th>Observation date</th>
<th>Weather</th>
<th>Peat marsh land (2^h)</th>
<th>Peat marsh land (5^h)</th>
<th>Peat marsh land (8^h)</th>
<th>Peat marsh land (11^h)</th>
<th>Peat marsh land (14^h)</th>
<th>Peat marsh land (17^h)</th>
<th>Peat marsh land (20^h)</th>
<th>Soybean land (2^h)</th>
<th>Soybean land (5^h)</th>
<th>Soybean land (8^h)</th>
<th>Soybean land (11^h)</th>
<th>Soybean land (14^h)</th>
<th>Soybean land (17^h)</th>
<th>Soybean land (20^h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 18–19</td>
<td>Sunny</td>
<td>-0.12</td>
<td>0.26</td>
<td>2.77</td>
<td>3.60</td>
<td>3.28</td>
<td>-0.31</td>
<td>-0.13</td>
<td>2.57</td>
<td>3.80</td>
<td>2.97</td>
<td>0.22</td>
<td>-0.38</td>
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</tr>
<tr>
<td>Sept. 3–8</td>
<td>Sunny, Sometimes doudy</td>
<td>-0.26</td>
<td>-0.22</td>
<td>1.43</td>
<td>2.82</td>
<td>2.24</td>
<td>0.07</td>
<td>-0.27</td>
<td>-0.35</td>
<td>-0.24</td>
<td>1.51</td>
<td>2.96</td>
<td>2.52</td>
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<td>-0.35</td>
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