Satellite-based temperature observations provide information with the spatial resolution over a large area, with any large error. On the other hand, satellite-based measurements result in surface temperature while ground-based observations are made at the weather stations provide air temperature data. Naturally, these two variables are different, their values can be compared in different ways. Moreover, the spatial resolution of the satellite- and ground-based observations are very different. The ground-based observations represent only the local surrounding of the weather stations, while the single point value of the satellite-based temperature dataset represents a larger area, e.g., a 1 km in case of MODIS. The purpose of our research is to analyze similarities and differences between temperature values observed by ground-based and satellite-based instruments, in the current analysis temperature dataset for 2000-2001 have been evaluated of ground-based temperature data from four weather stations of the Hungarian Meteorological Service and Budapest-based MODIS surface temperature (NASA, 1999) for the main gout periods. We calculated monthly, seasonal and annual mean temperature values. The results suggest that daytime nighttime satellite-based surface temperature is higher than ground-based air temperature (especially in summer/winter). This can be explained by the faster warming and cooling of the surface than those of the atmosphere.

**Satellite-based temperature data**

- The average temperature of the two used weather stations is close to rural mean temperature.
- The difference between these is 3°C.
- Urban mean temperature is 4°C higher than rural mean temperature.

**Comparison of the two observing methods**

<table>
<thead>
<tr>
<th>Observation type</th>
<th>Remotely sensed</th>
<th>In situ, using WMO Certified Instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground-based</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satellite-based</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Temporal resolution**

- Time: 1 to 45 min, should projection
- Limited number of observations

**Summarizing of the weather stations**

- Measured or calculated meteorological variable
- Surface temperature
- Air temperature
- Accessibility
- In case of webinar only
- Any time
- Continuously

**Observation Instruments**

- MODIS, GISS, JPL, University of Maryland

**Radiation**

- Measurement of surface temperature
- Microwave satellite data
- Satellite data used for this work: the difference between satellite-based and ground-based temperature values is not as significant in spring and autumn. However, the two temperature values are significantly different in winter and summer.

**Frequency distribution difference between satellite-based surface temperature and ground-based air temperature**

The smallest difference between the satellite-based and ground-based mean temperature values can be found in winter. The largest difference between the satellite-based and the ground-based temperature values is found in summer and spring.

**Differences between monthly mean temperature values observed with ground-based and satellite-based methods**

- From March to October: surface temperature is higher than air temperature. The warmest: Lágymányos, the coldest: Újpest in winter.
- Air temperature is higher than surface temperature.
- The two stations located in Budapest (Buda) are warmer than the station located near the Danube (Budapest).

**Day-time**

- Cold in NW area (hills of Buda): service possibility 1340, possible 10
- The possibility of 1340, 40 nm radiation is supported the the city border, in these points:
- Summer: 20-30°C, 2004
- April: 5°C, 10°C (data from 2003)
- The spatial resolution of the satellite-based observations are also different.

**Mean temperature**

- The satellite-based air temperature observations provide information with the spatial resolution over a large area, without any large error. The other hand, satellite-based measurements result in surface temperature while ground-based observations are made at the weather stations provide air temperature data. Naturally, these two variables are different, their values can be compared in different ways. Moreover, the spatial resolution of the satellite- and ground-based observations are very different. The ground-based observations represent only the local surrounding of the weather stations, while the single point value of the satellite-based temperature dataset represents a larger area, e.g., a 1 km in case of MODIS.

**Mean temperature**

- The average temperature of the two used weather stations is close to rural mean temperature.
- The difference between these is 3°C.
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**Satellite-based air temperature observations**

- MODIS measurements of Terra and Aqua MODIS ground-based measurements around Terra passing time
- In general, positive differences are dominant in day-time and negative at night-time, which implies that satellite data represent better the diurnal variation of the surface temperature compared to the hourly temperature observations.

**Annual mean temperature**

- The smallest difference between the satellite-based and ground-based mean temperature values can be found in winter. The largest difference between the satellite-based and the ground-based temperature values is found in summer and spring.

**Satellite-based air temperature observations**

- MODIS measurements of Terra and Aqua MODIS ground-based measurements around Terra passing time
- In general, positive differences are dominant in day-time and negative at night-time, which implies that satellite data represent better the diurnal variation of the surface temperature compared to the hourly temperature observations.

**Frequency distribution difference between satellite-based surface temperature and ground-based air temperature**

- The smallest difference between the satellite-based and ground-based mean temperature values can be found in winter. The largest difference between the satellite-based and the ground-based temperature values is found in summer and spring.

**Ground-based observations**

- MODIS measurements of Terra and Aqua MODIS ground-based measurements around Terra passing time
- In general, positive differences are dominant in day-time and negative at night-time, which implies that satellite data represent better the diurnal variation of the surface temperature compared to the hourly temperature observations.

**References**