Overview and Update of SoWMEX/TiMREX
Southwest Monsoon Experiment/Terrain-influenced Monsoon Rainfall Experiment

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The Goal of SoWMEX/TiMREX:

Through advancing basic understanding of the southwest monsoon flows in the open ocean and the orographic precipitation processes over monsoon environment to improve current capability of severe weather nowcasting and quantitative precipitation estimation and forecasting in the Taiwan area.

(occurrence frequency of heavy rain >50mm/day May 15 to June 15, 1992-2004)
Scientific objectives of SoWMEX/TiMREX

1. Terrain effect on the flow and MCSs
2. MCSs dynamics, microphysics, and predictability
3. Mesoscale data assimilation/QPF
4. Convection initiation/diurnal cycle/boundary layer processes

Multiscale interaction problem
Field observations from May 15-June 25, 2008 (SOP), 4 sondes/day, IOP 8 sondes/day, EOP continuous IOP (with dropsonde operation).
Radar observations including: SDOP, SPOL, XDOP, XPOL, Verti-X, ISS, POSS, MRR
Scientific results of SoWMEX/TiMREX

1. Environment and MCSs: Richard Johnson, Paul Ciesielski, Yi-Leng Chen, Chun-Chieh Wang, Koung-Yin Liu, Hsiao-Wei Lai, Chris Davis, Weixin Xu, Edward Zipser, Jong-Hoon Jeong

2. Storm initiation: Jim Wilson, Rita Roberts, Ping-Feng Lin, Pao-Liang Chang, Cheng-Ku Yu, Weixin Xu, Ching-Hwang Liu, Shao-Ching Hwang, Radian Hsiu

3. Storm microphysics: Angela Rowe, Dong-In Lee, Sung-A Jung, Pay-Liam Lin, Taro Shinoda, Wenhua Gao

4. SPOL and QPE: John Hubbert, J Vivek, Tai-Chi C Wang, Xin-Hao Liao, Angela Rowe, Wei-Yu Chang, Ultimate Jung

5. Data assimilation and QPF: Jenny Sun, Amanda Anderson, Yu-Chieng Liou, Fang-Ching Chien, Ming-Jen Yang, Yi-Yun Chen

6. Tropical cyclones and others: YQ Wang, Mayumi Yoshioka, Jim Moore, L Feng, CC Wang, Nan-Ching Yeh, WJ Chen
Tragedy in Shiao-Lin, South Taiwan

- In Jiasian Township of Kaohsiung County
- More than 400 died and many missing
- Landslide, barrier lake and mountain collapse

Buried Area

Before  After
Typhoon Morakot and multiple convective rainbands
Terrain effect on radar QPE

Fig. 2. Illustration of the experimental setup.
2010 SoWMEX/TiMREX rain measurement site map   SOP: May 27-June 16, 2010
Uniformly distributed

Maximum occurred in the slope

Increases with altitudes

Decreases with altitudes
QPESUMS grid and comparison with rain gauges
28-30 May 2010 (72hrs)

<table>
<thead>
<tr>
<th></th>
<th>SS</th>
<th>R1</th>
<th>R2</th>
<th>R3</th>
<th>R4</th>
<th>RAD-CorCoef</th>
<th>SS</th>
<th>R1</th>
<th>R2</th>
<th>R3</th>
<th>R4</th>
<th>RAD-Error rate(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obs. AccPpn</td>
<td>258.0</td>
<td>222.0</td>
<td>279.8</td>
<td>117.0</td>
<td>233.4</td>
<td>0.95</td>
<td>0.90</td>
<td>0.94</td>
<td>0.50</td>
<td>0.96</td>
<td>-48.41</td>
<td></td>
</tr>
<tr>
<td>Rad. AccPpn</td>
<td>133.1</td>
<td>115.7</td>
<td>113.4</td>
<td>123.1</td>
<td>117.3</td>
<td>-47.88</td>
<td>-52.67</td>
<td>5.21</td>
<td>-49.74</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Tipping bucket rain gauge accuracy
SS: 0.5mm
TR: 0.5mm
R4: 0.2mm

Three different classes of rain rates:
weak, moderate, and heavy 0-3 mm/hr,
3-15 mm/hr, >15 mm/hr
All data means all other data.
### Rainfall statistics for the Taiwan Meiyu season of 2008/2009/2010

<table>
<thead>
<tr>
<th>Station/Rainfall (mm)</th>
<th>Tai-pei (N)</th>
<th>Tai-chung (C)</th>
<th>Kao-hsiung (S)</th>
<th>Heng-chuun (P)</th>
<th>A-li-shan</th>
<th>Sun-Moon Lake</th>
<th>I-Lan (E-N)</th>
<th>Hwa-lien (E-C)</th>
<th>Tai-tung (E-S)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>May (mean)</strong></td>
<td>258</td>
<td>225</td>
<td>177</td>
<td>164</td>
<td>531</td>
<td>354</td>
<td>264</td>
<td>195</td>
<td>157</td>
</tr>
<tr>
<td><strong>May (08/09/10)</strong></td>
<td>319/25/184</td>
<td>332/21/145</td>
<td>107/14/188</td>
<td>32/02/254</td>
<td>378/95/523</td>
<td><strong>409/70/238</strong></td>
<td>132/41/95</td>
<td>72/142/95</td>
<td>55/78/121</td>
</tr>
<tr>
<td><strong>June (mean)</strong></td>
<td>319</td>
<td>343</td>
<td>398</td>
<td>371</td>
<td>711</td>
<td>483</td>
<td>252</td>
<td>220</td>
<td>248</td>
</tr>
<tr>
<td><strong>June (08/09/10)</strong></td>
<td>361/277/420</td>
<td>183/422/530</td>
<td><strong>1200/312/257</strong></td>
<td>653/87/197</td>
<td>496/613/458</td>
<td>440/283/474</td>
<td>173/216/154</td>
<td>170/320/61</td>
<td>327/100/53</td>
</tr>
</tbody>
</table>

**Chiayi** 189/351 (Mean), 68/09/104 (May), 288/256/270 (June)

(2008) In May, N Taiwan has more rainfall than climate (1971-2000). In June, S Taiwan has much more rainfall than climate. The mountain rainfall is much less than the climate mean (A-Li-Shan)

(2009) In May, Taiwan was very dry. In June, Tai-Chung has more rain than climate mean.

(2010) In May, S Taiwan has more rainfall than climate. In June, N Taiwan has more.
Webpage of SoWMEX-2010
Concluding remarks

• SoWMEX/TiMREX is an ongoing program. In 2009 and 2010, field observations with dropsondes and rain measurement are conducted and will continue to 2012.

• Thanks to professors and students from the Universities of Taiwan, USA, Japan, and Korea, and Agencies: NCAR/NSF, CWB + NSC + WSCB + NCDR for funding support and dedicated contribution to the success of SoWMEX/TiMREX. Scientific results from the experiment are coming out.

• Further collaborations are anticipated.