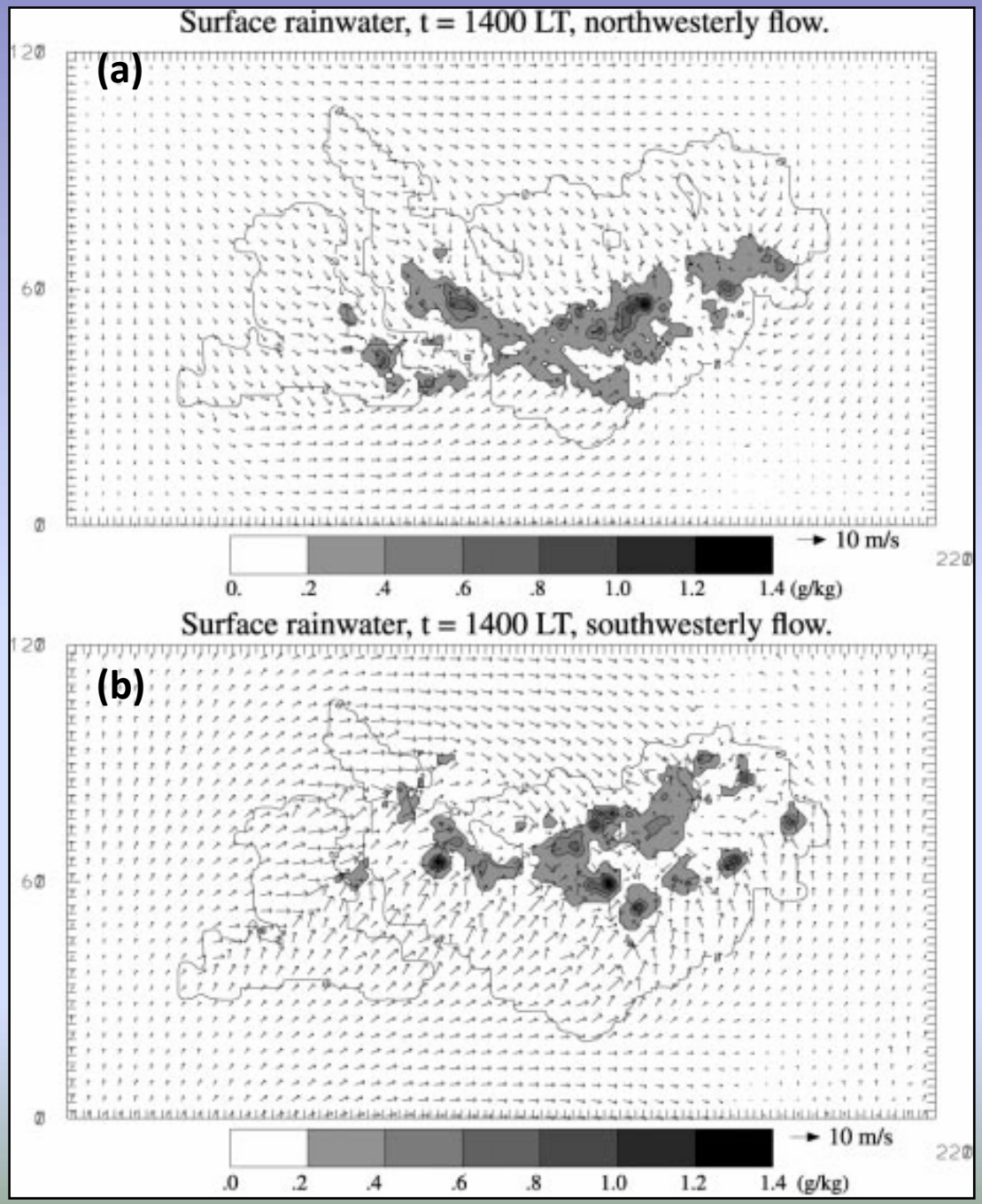
臺灣地區午後對流閃電空間特性初步分析

戴志輝[1]　林博雄[1]　張培臣[2]

台灣大學大氣資源與災害研究中心[1]
空軍氣象聯隊[2]

Outline

- introduction
- data and days with afternoon lightning
- preliminary results
- the prospects



In flat island situation

(a) Surface rainwater and vector fields for (a) low-level northwesterly winds and (b) low-level southwesterly winds.

（Crook 2001）

UHI(urban heat island)-induced mesoscale circulation
(Chen et al. 2007)

•low-level topography-induced local circulation
•mid-level steering flow
(Tai et al. 2008)

convergence between cross-mountain easterly and sea breeze and upslope flow
(Lin and Kuo 1996)

- Neither the dynamic forcing nor the land surface forcing (including the thermal and viscous effects) alone is adequate to account for the trade wind rainfall in islands of Hawaii.

- The rainfall amounts for the islands of Hawaii are related to rising motions caused by nonlinear interactions among island blocking, orographic lifting, and the surface forcing.

Yang and Chen 2008

A sample of TLDS record

01/07/2004 13:00:13

;00C8FFFFFFFFFFFFFFFFFF;1;0;6689;238722;1204579;0;24;0;0;0;0;0;0;4;5;0

types
0 Intra Cloud
1 starting of inter cloud
2 ….
3 ….
4 Cloud to Ground
5 ….

- 12-18 LST
- excluding tropical system, frontal passage, …..

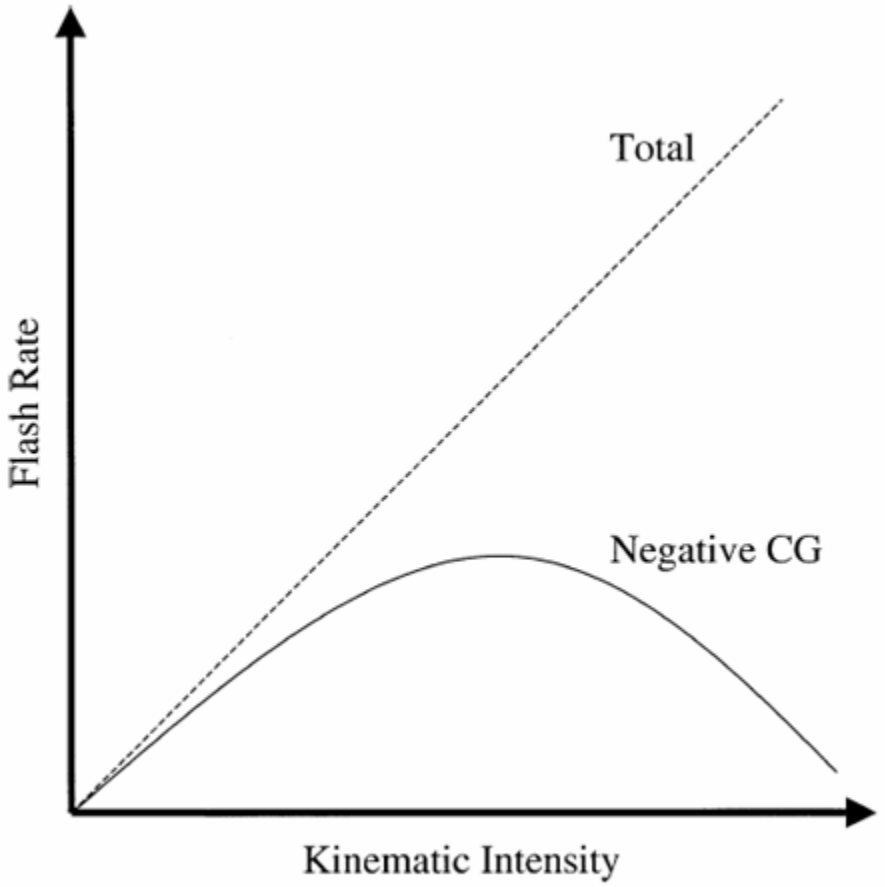
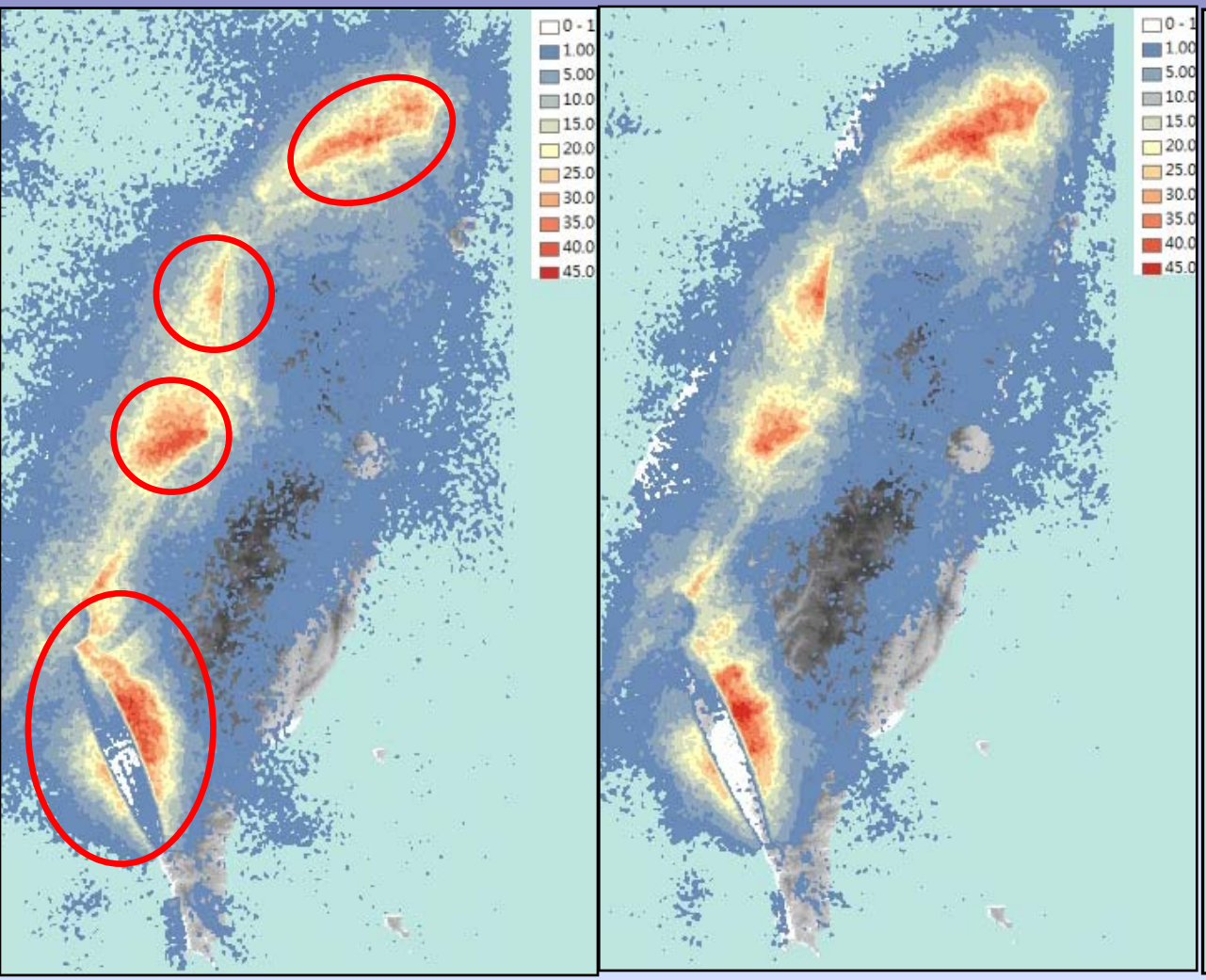
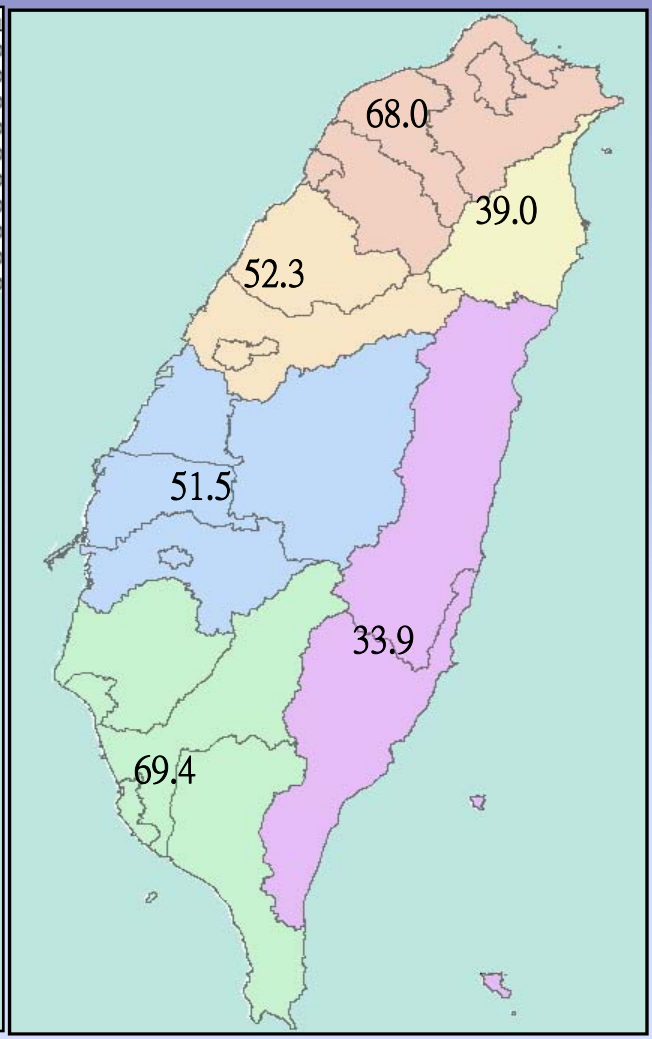


FIG. 1. Schematic representation of the impact of the elevated charge mechanism on lightning flash rates. Note that total flash rate and negative CG flash rate are plotted on different scales.

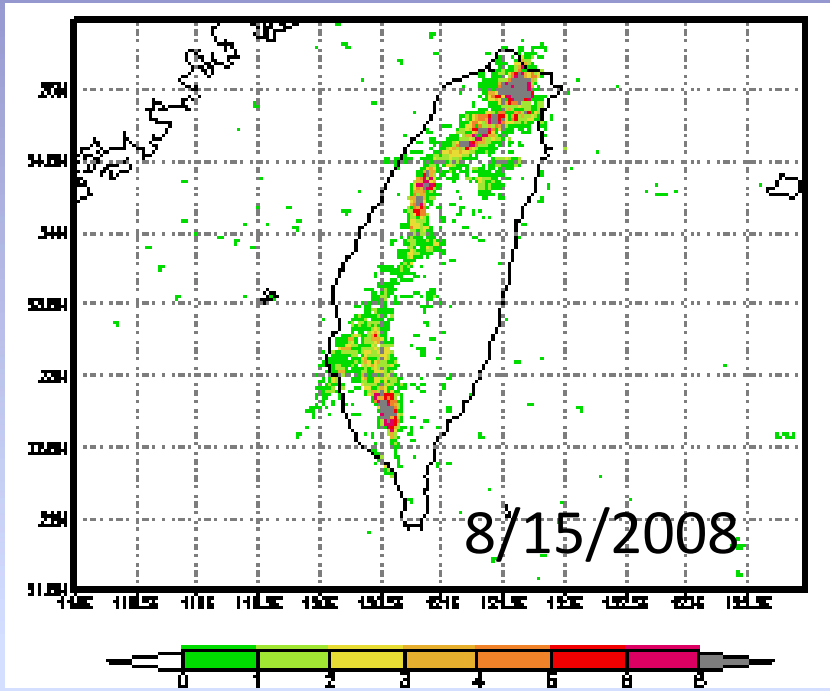
- **typical convection lasts approximately 1 h and becomes electrically active after the ice phase develops.**
- **initial flashes are typically intracloud (IC) flashes.**
- **cloud-to-ground (CG) lightning flashes tend to occur as the main core of the cell descends to lower altitudes.**
- **CG flashes typically peak after the ICs.**

Lang and Rutledge 2002





Number of TSa days during 2007-09. (L)intra cloud, (M)inter cloud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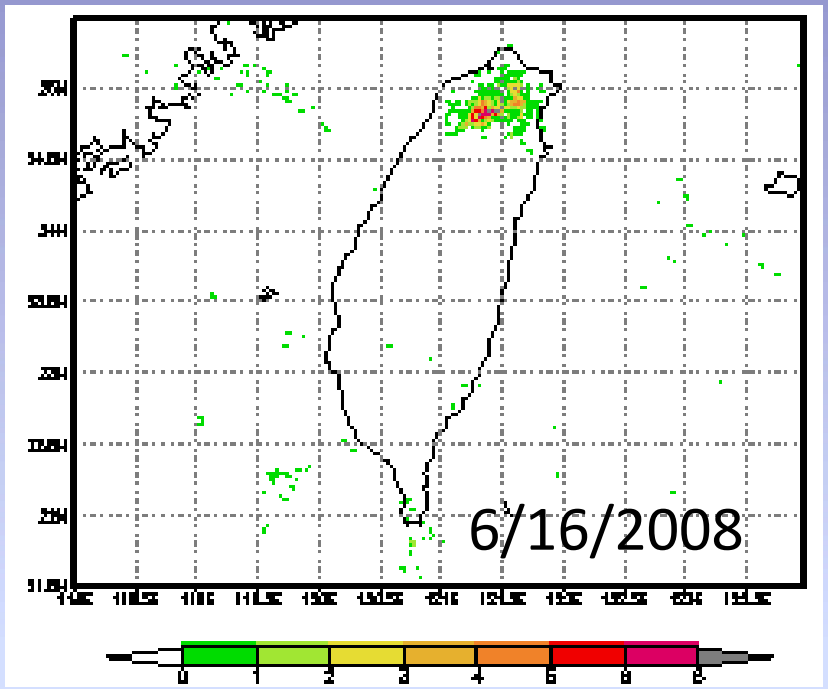
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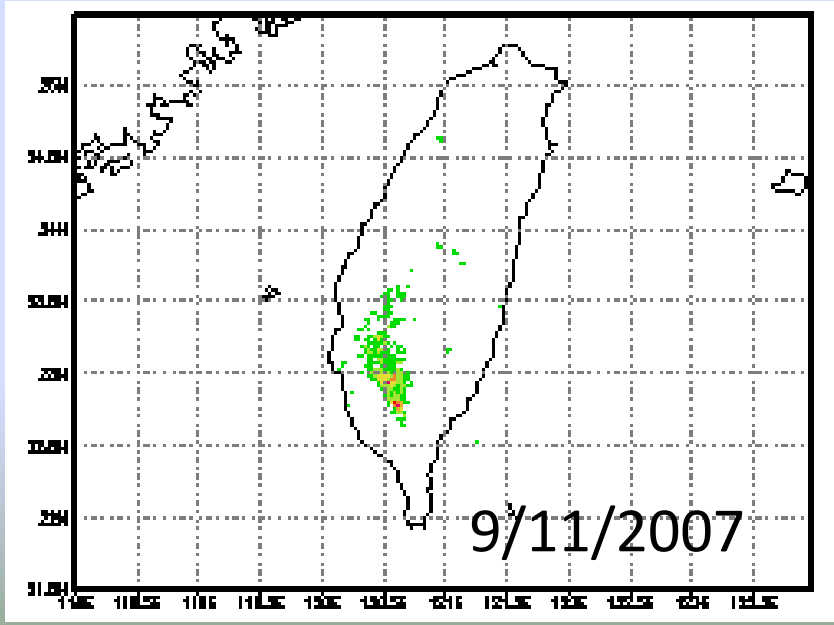
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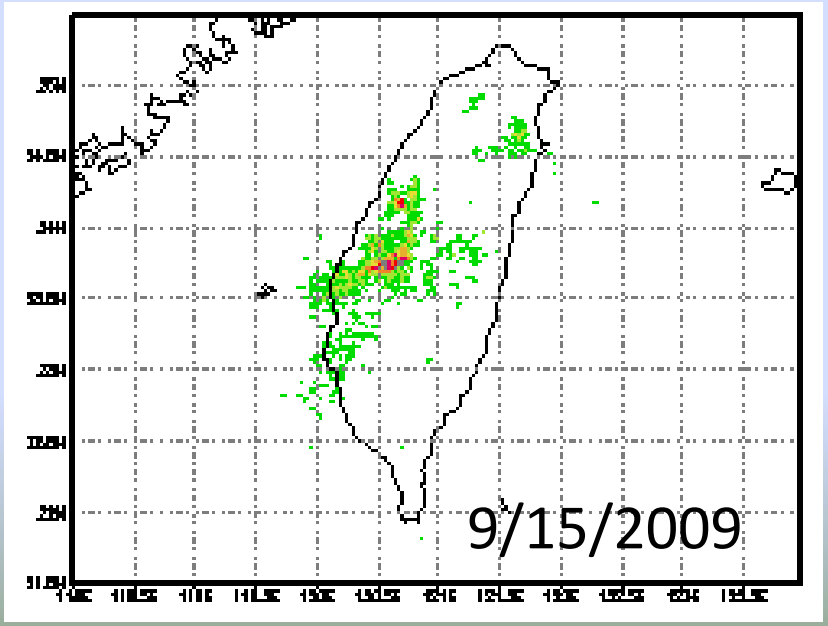
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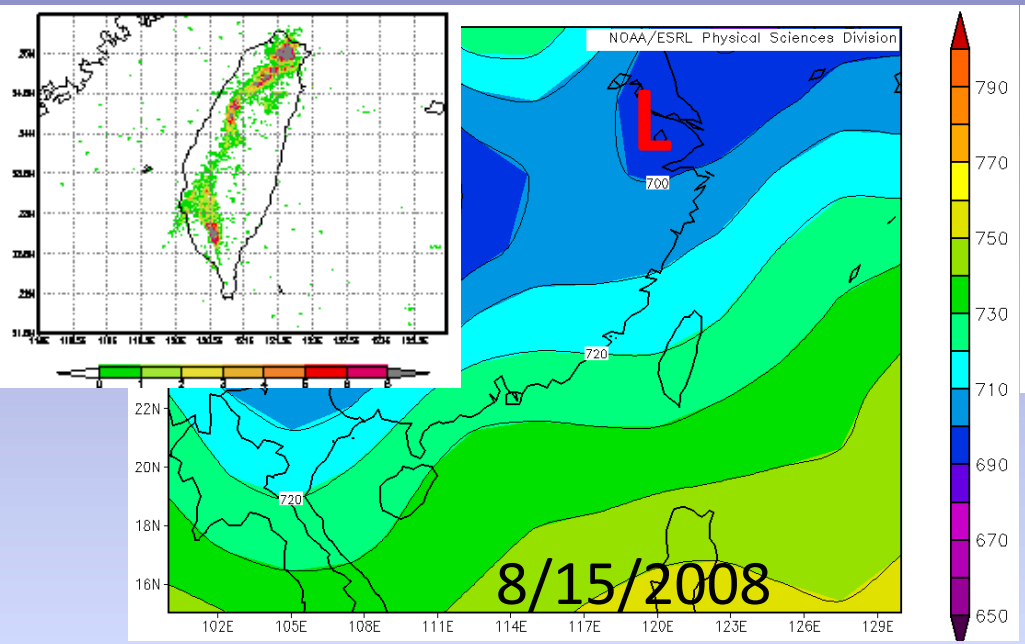
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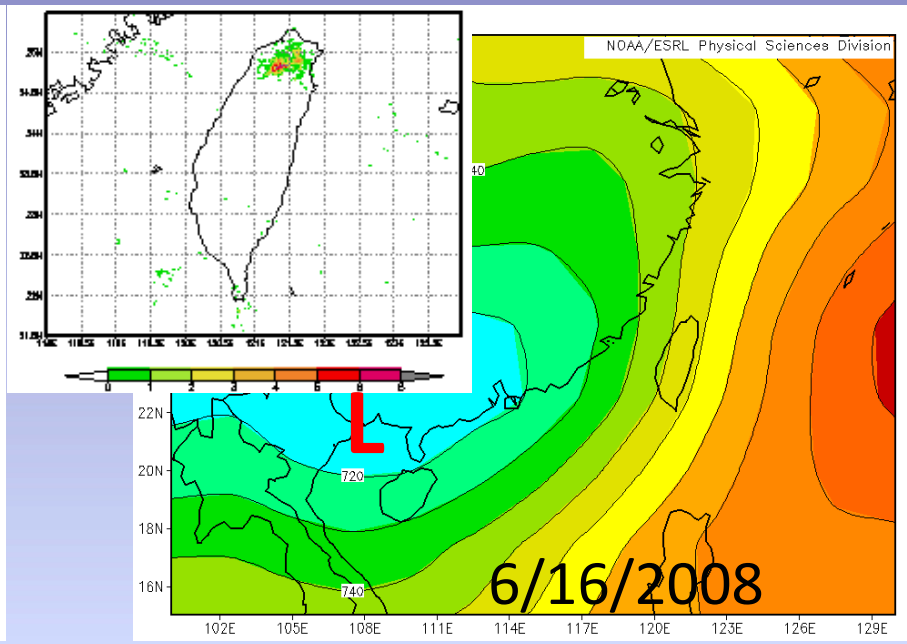
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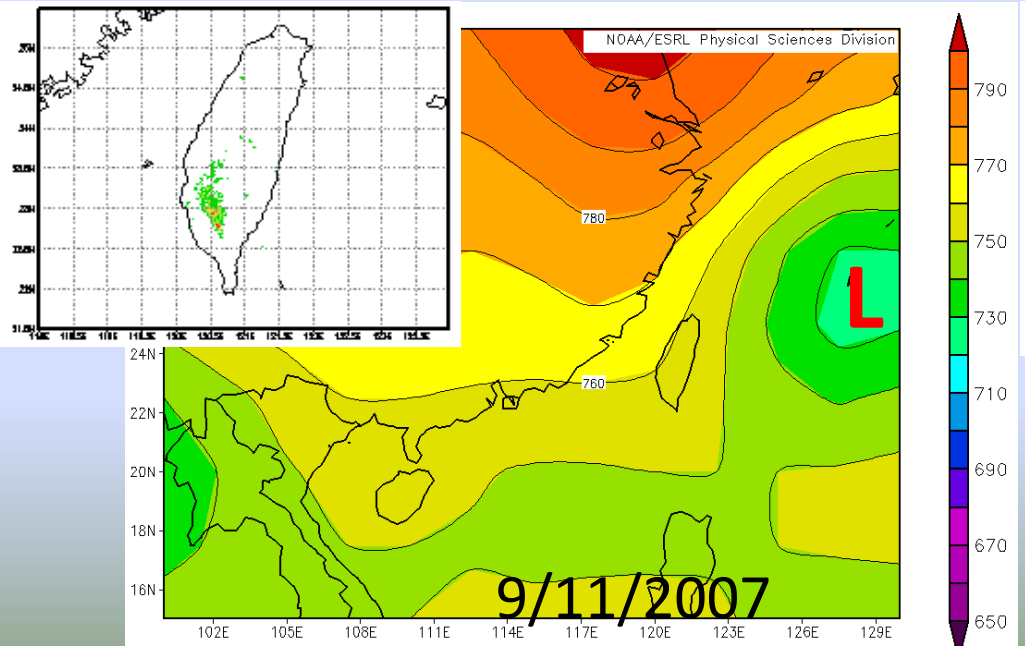
925 hPa GH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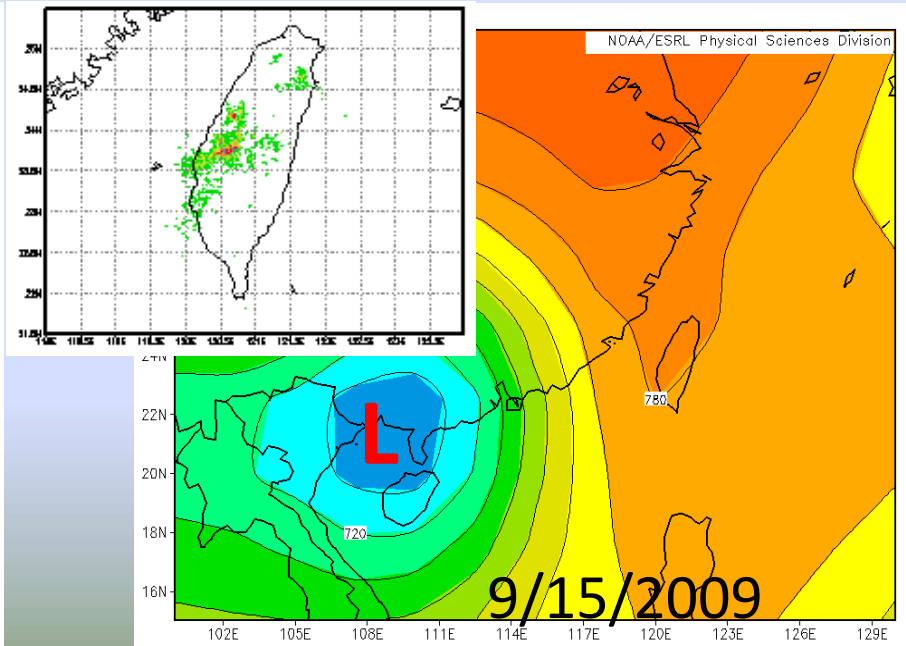
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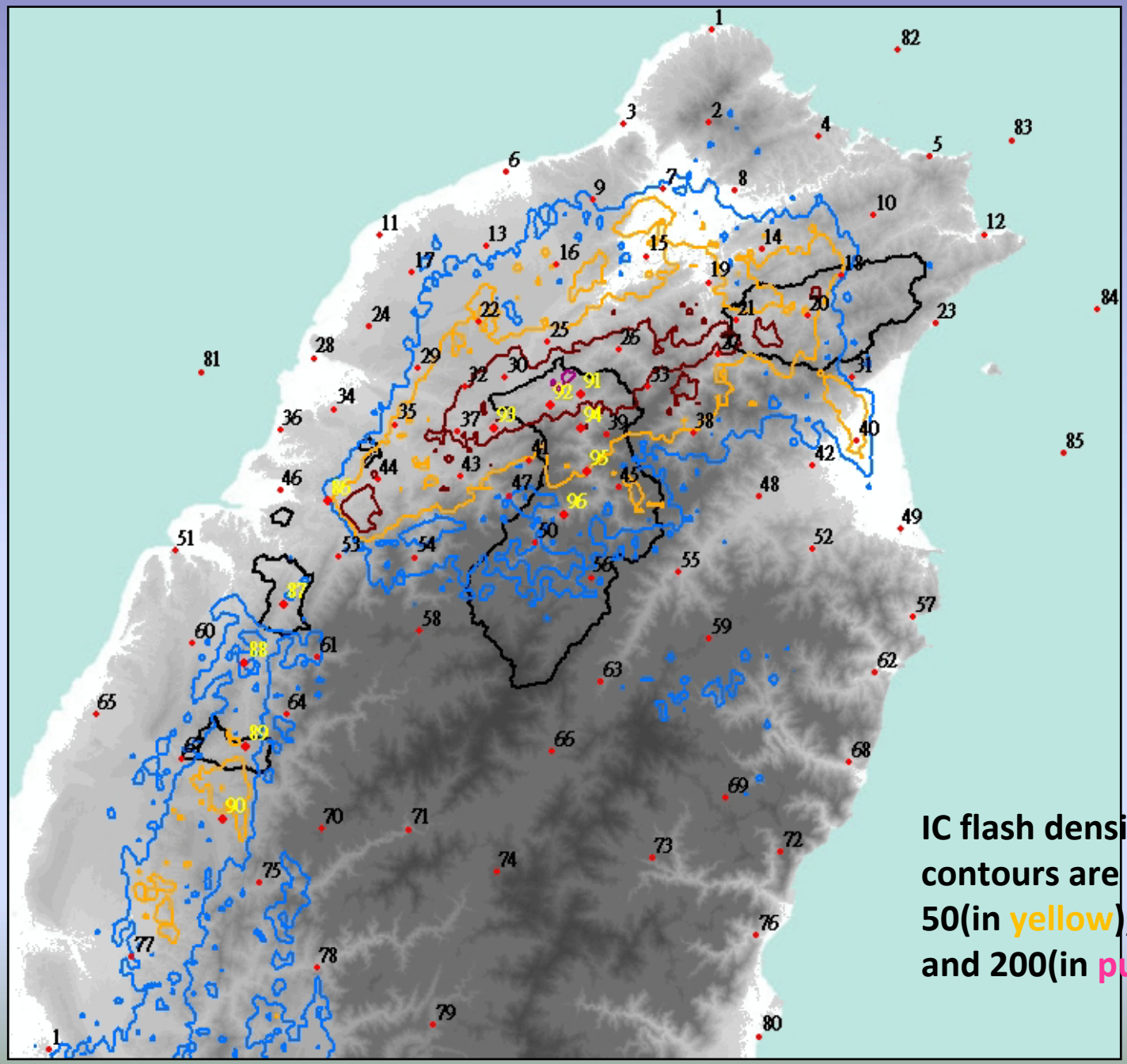
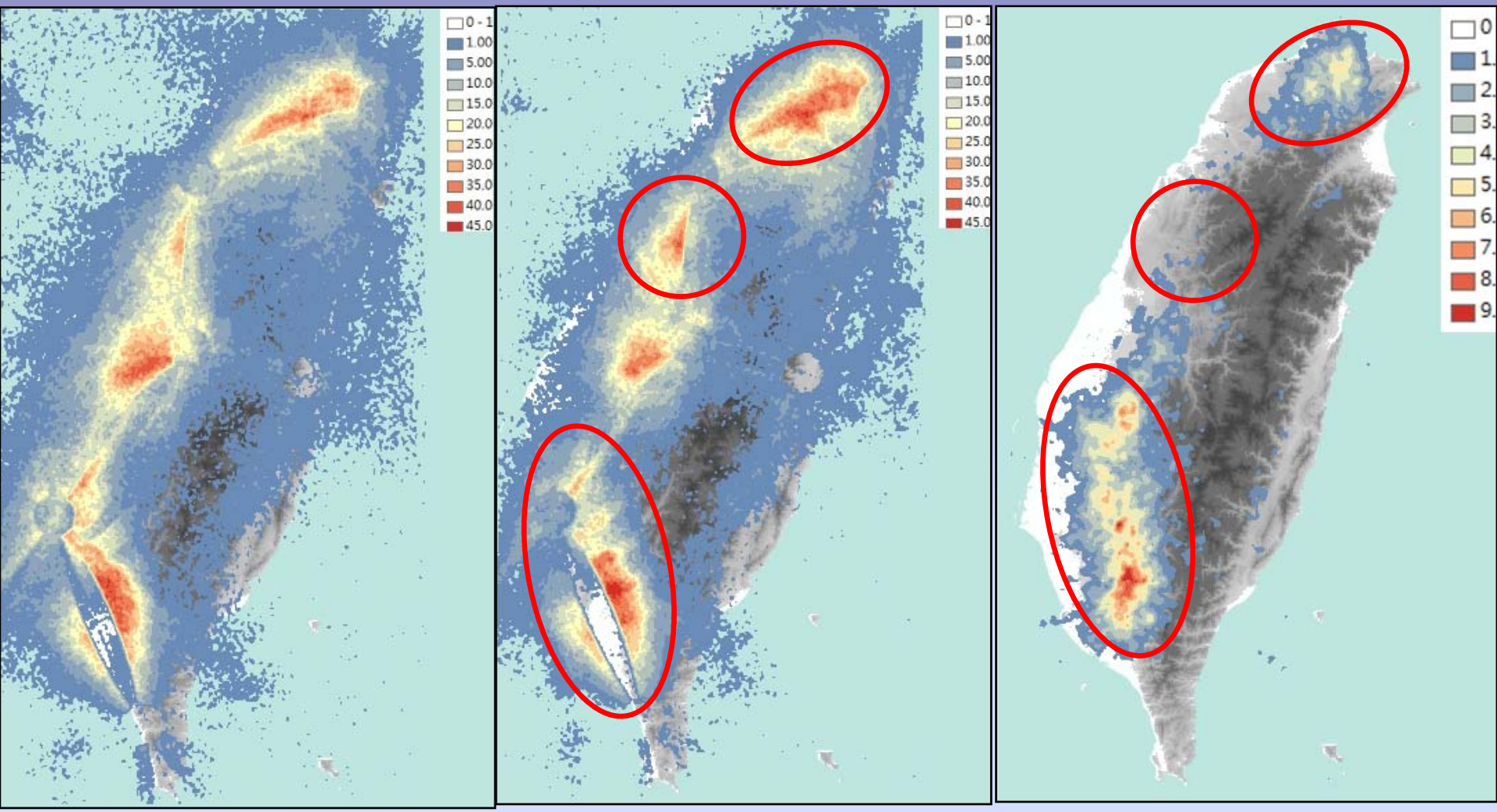
The Prospects

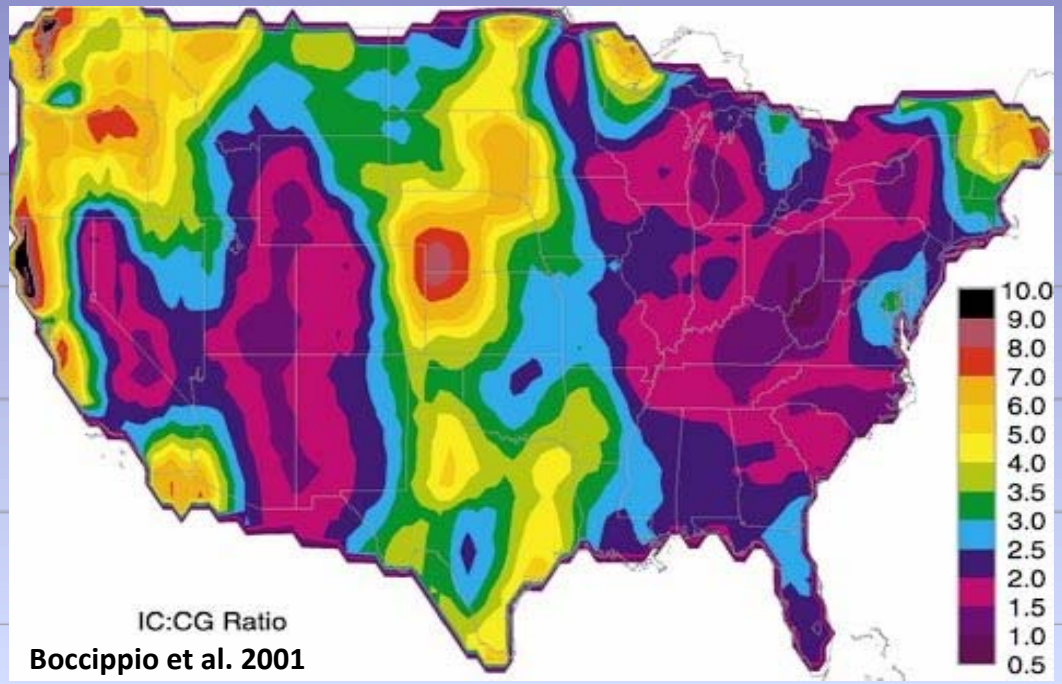
- **Categorizing the afternoon convective activity and associated favorable synoptic conditions.**
- **The favorable districts for afternoon convection, which can be identified by analyzing the inter and intra cloud lightning, have to be recognized to determine the feasibility of warm-season cloud seeding as a long-term strategy.**



IC flash density during 2007. contours are at 25(in blue), 50(in yellow), 100(in brown), and 200(in purple)

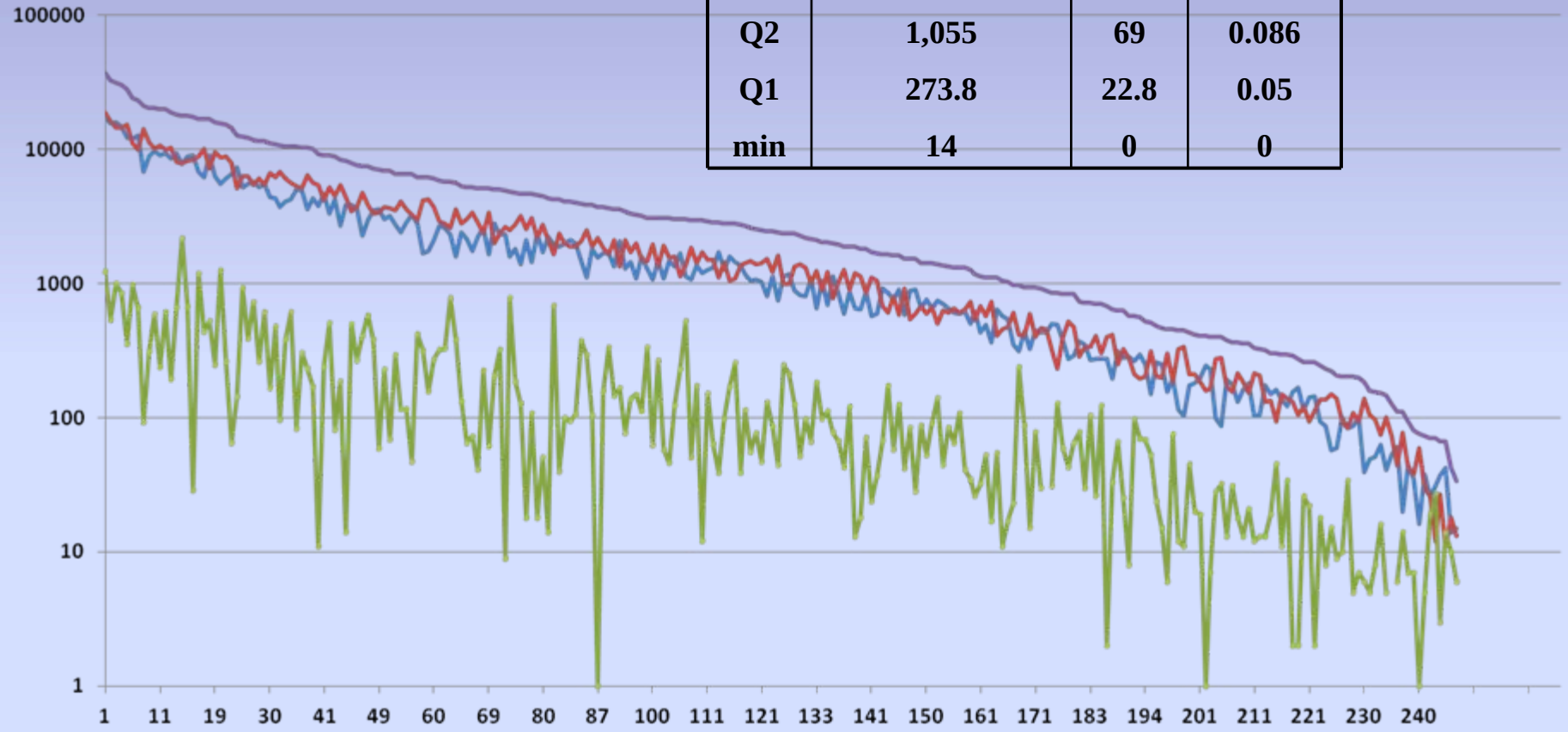


Number of TSa days during 2007-09. (L)intra cloud, (M)inter cloud, and (R)CG



CG:IC ratio for all 248 TSa days during 2007-09.

	Intra cloud(IC)	CG	CG/IC
Avg	2,112.1	170.3	0.126
max	17,370	2,188	0.871
Q3	2,379.3	196	0.156
Q2	1,055	69	0.086
Q1	273.8	22.8	0.05
min	14	0	0



2007至09年，248次午後對流個案之全閃電(紫色)總次數排序。紅、藍及綠色各爲相伴的雲間、雲中及雲地閃電次數(縱軸，對數刻度)。