Statistical Location and Timing of the Convective Lines off the Mountainous Coast of Southeastern Taiwan from Long-Term Radar Observations

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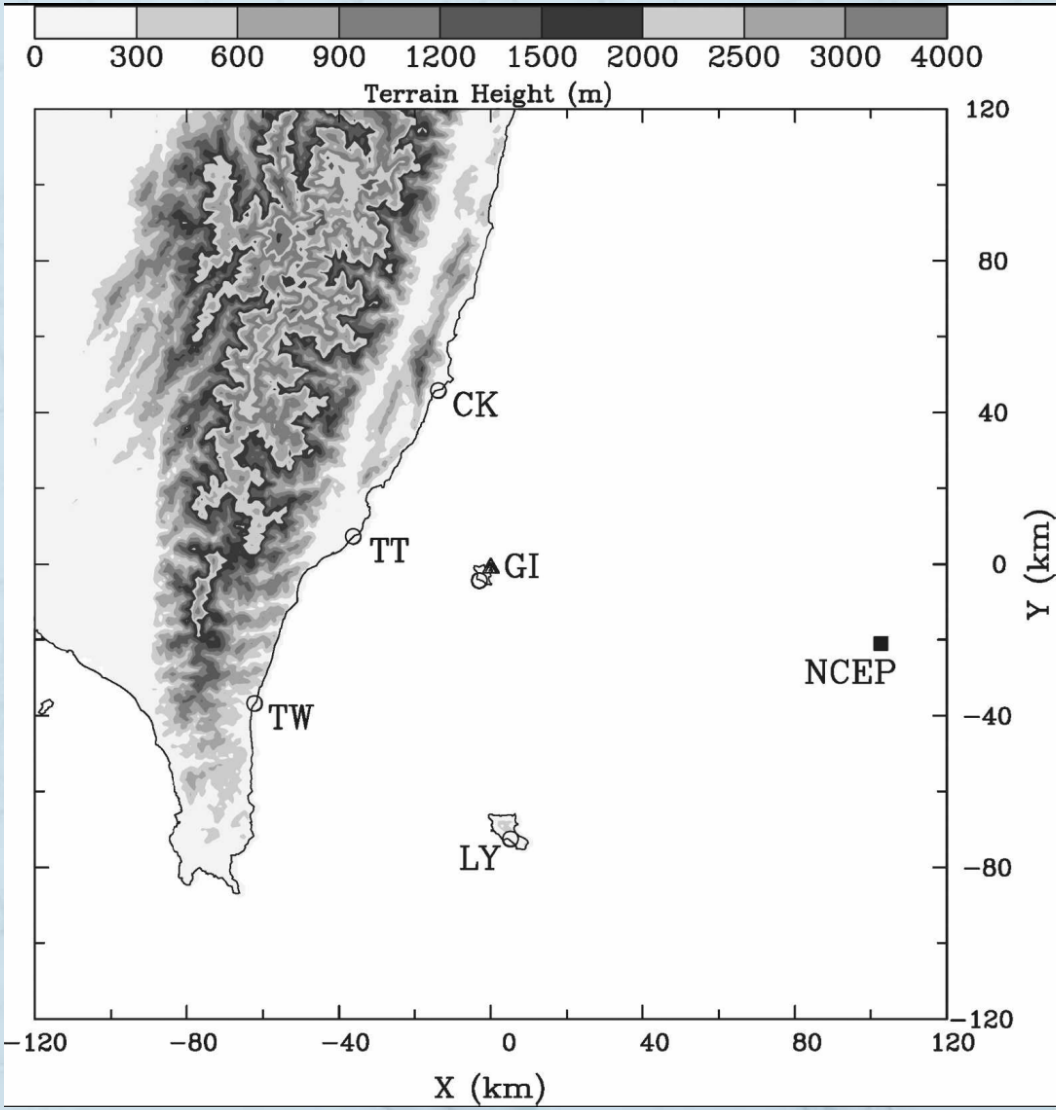
outline

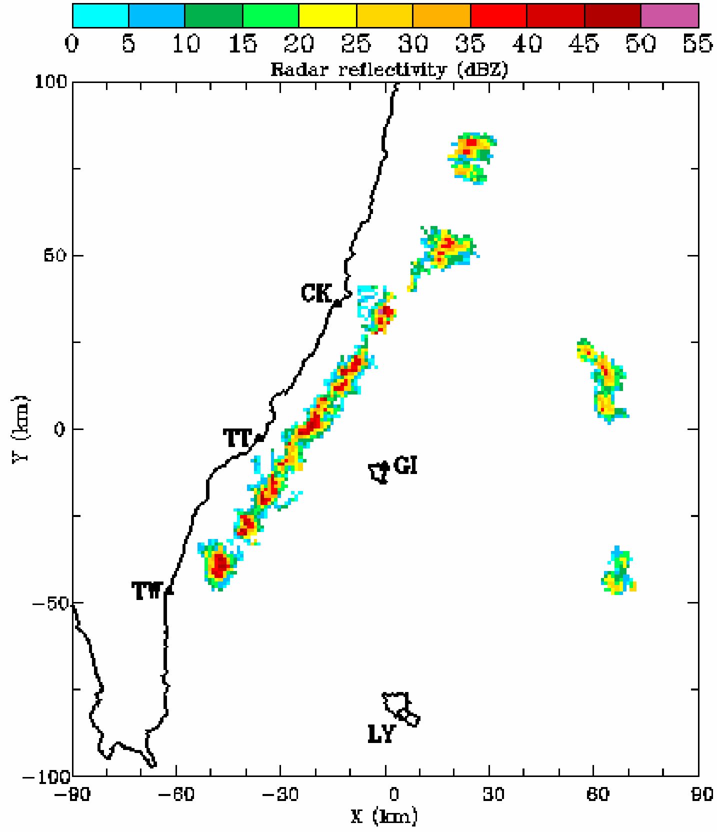
- Introduction
- Overview of data and cases of convective lines
- Statistics of all cases
- Nearshore and offshore convective lines
- Conclusions

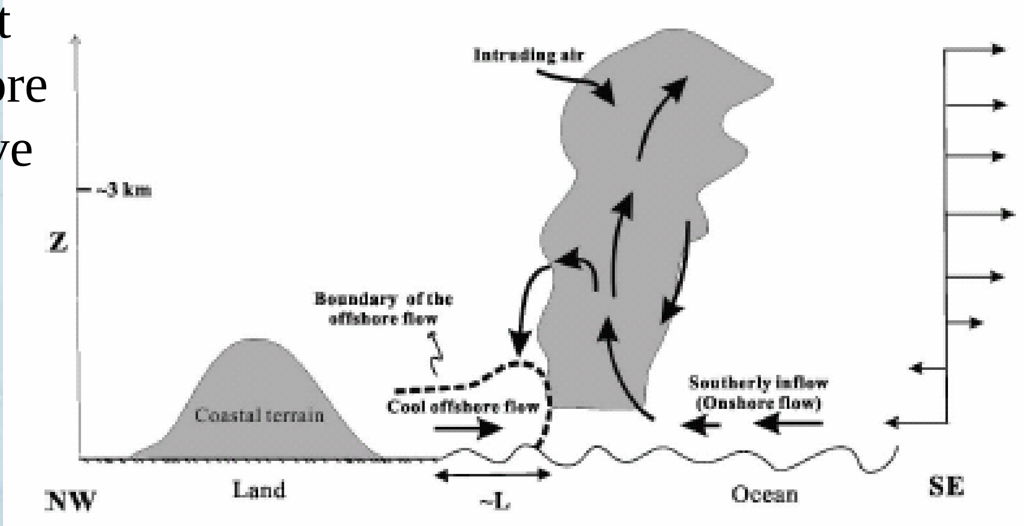
Introduction

- The geographical location of southeastern Taiwan is a complicated coastal environment and usually can produce strong diurnal and topographic forcings contributing to the formation of moist convection.

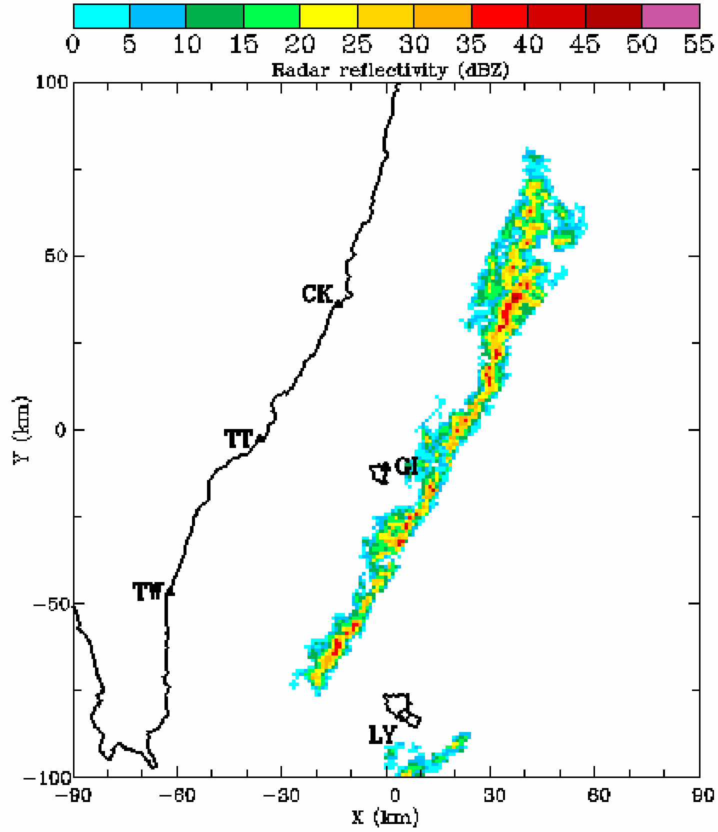


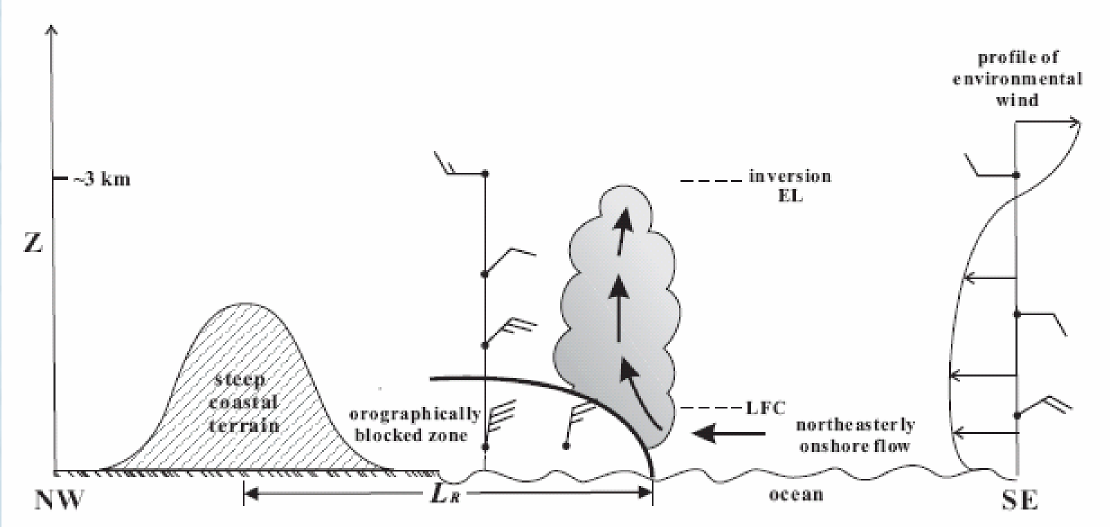
- Yu and Jou (2005) analyzed the convective lines off the southeastern coast of Taiwan during 11-15 May 1998. Their detailed analyses of an intense event on 14–15 May showed that the low-level convergence, produced as the coastal cool offshore flow developing at night encountered the prevailing onshore flow, was an important convective forcing contributing to the formation of the convective line.





- Yu and Hsieh (2009) also investigated a specially chosen case of well offshore line on 3 January 2004. They indicated the low-level convergence generated as the prevailing easterly onshore flow encountered the nearshore blocked flow was found to provide lifting contributing to the formation of the offshore convective line.





Research motive and purpose ：

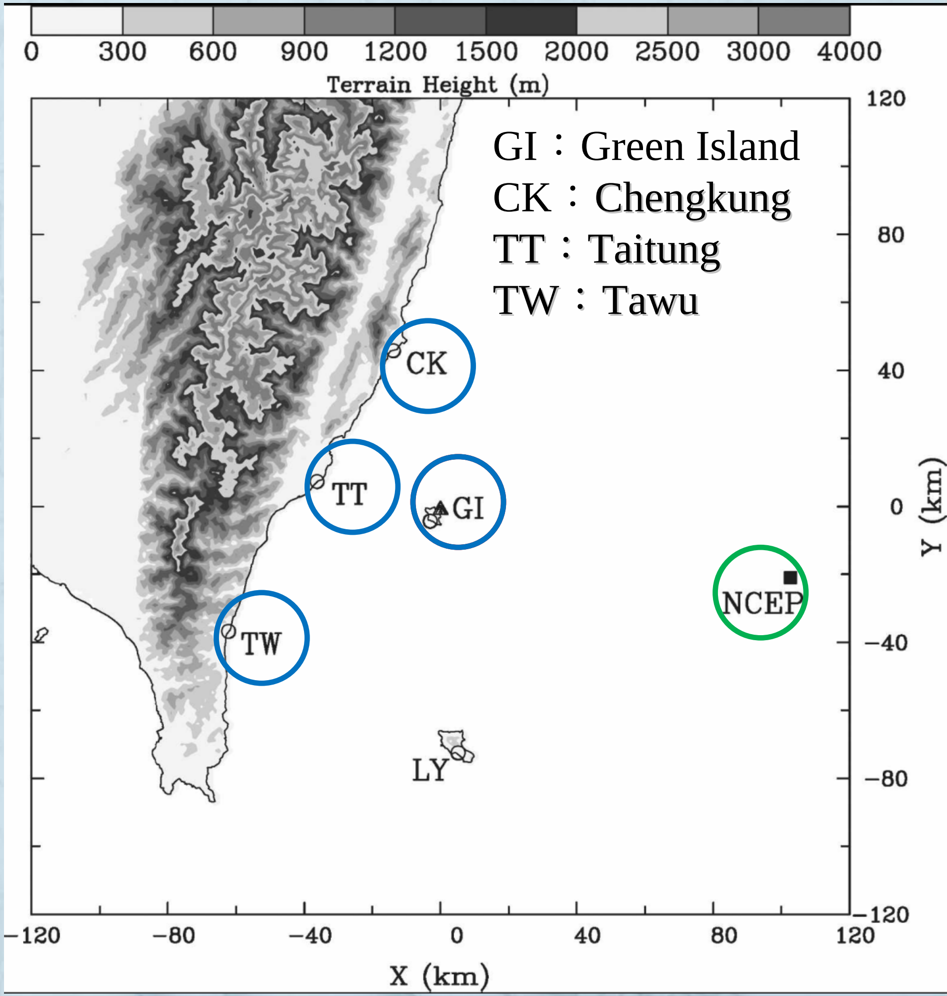
- Because previous investigations of convective lines were focused only on a few particular cases or months, the general characteristics of this phenomenon are not still well understood.

- This study uses the long-term observations from the C-band Doppler radar on Green Island collected during 1998–2004 to investigate their statistical characteristics.

Overview of data and cases

Data source

- The C-band Doppler radar data on Green Island, off the eastern coast of Taiwan, and include volumetric distributions of reflectivity and radial velocity.
- Surface observations within the coastal zone of southeastern Taiwan.
- 1000hpa NCEP reanalysis gridded data located ~130 km off the southeastern coast of Taiwan.



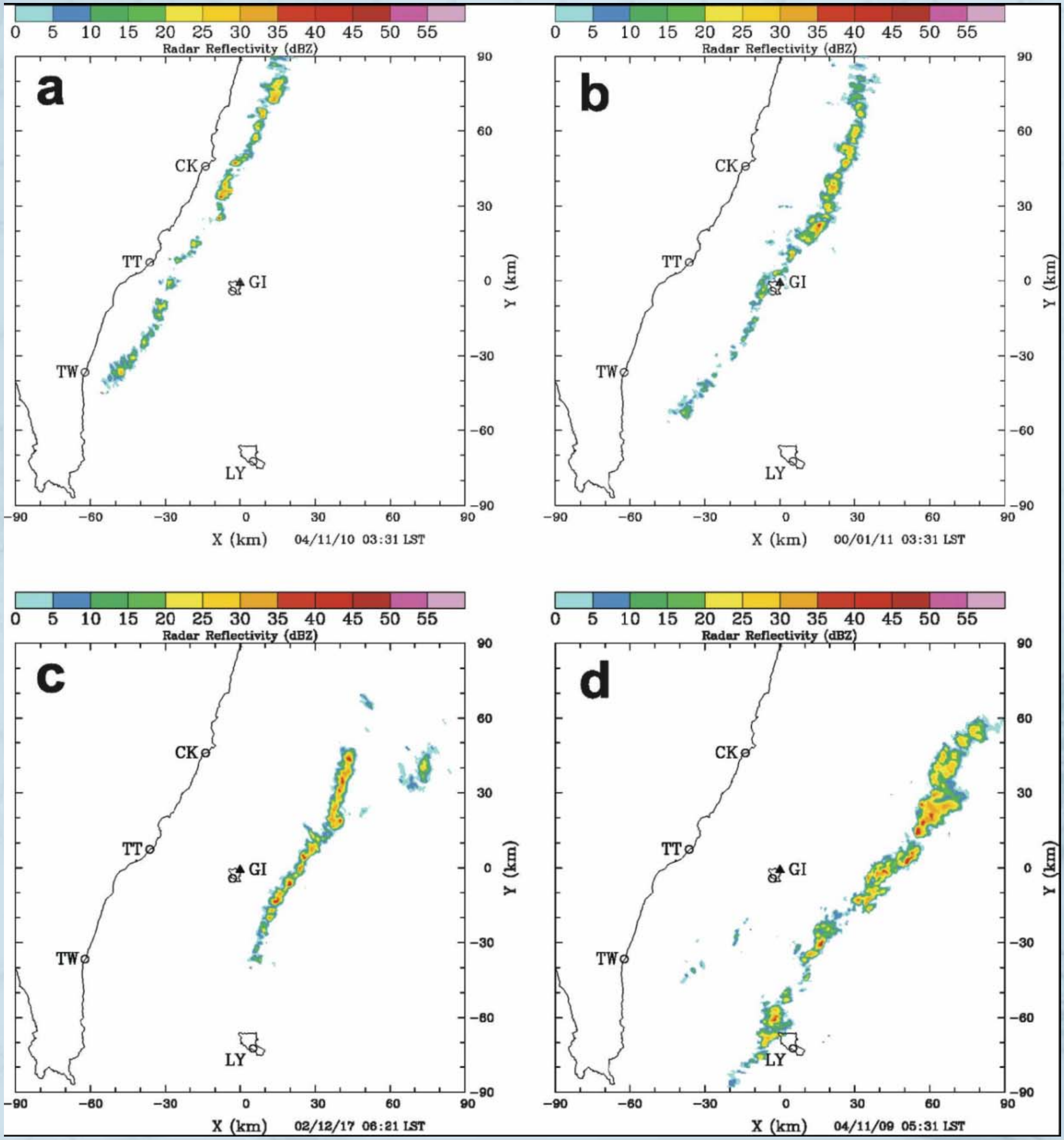
Selected criteria of cases of convective lines

- The large-scale environment associated with the observed convective lines must be weakly synoptically weather conditions.
- A line pattern of radar reflectivity must persist for at least 1 h or longer.
- The length of the convective line must be greater than 50 km during its most intense stage.
- According to the above criteria, 211cases of convective lines are identified.

Season	Spring			Summer			Autumn			Winter		
Month	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
No. of cases	20	33	21	5	6	9	9	20	25	29	18	16
Available radar observations (days)	82	120	107	114	153	124	74	71	96	118	88	106

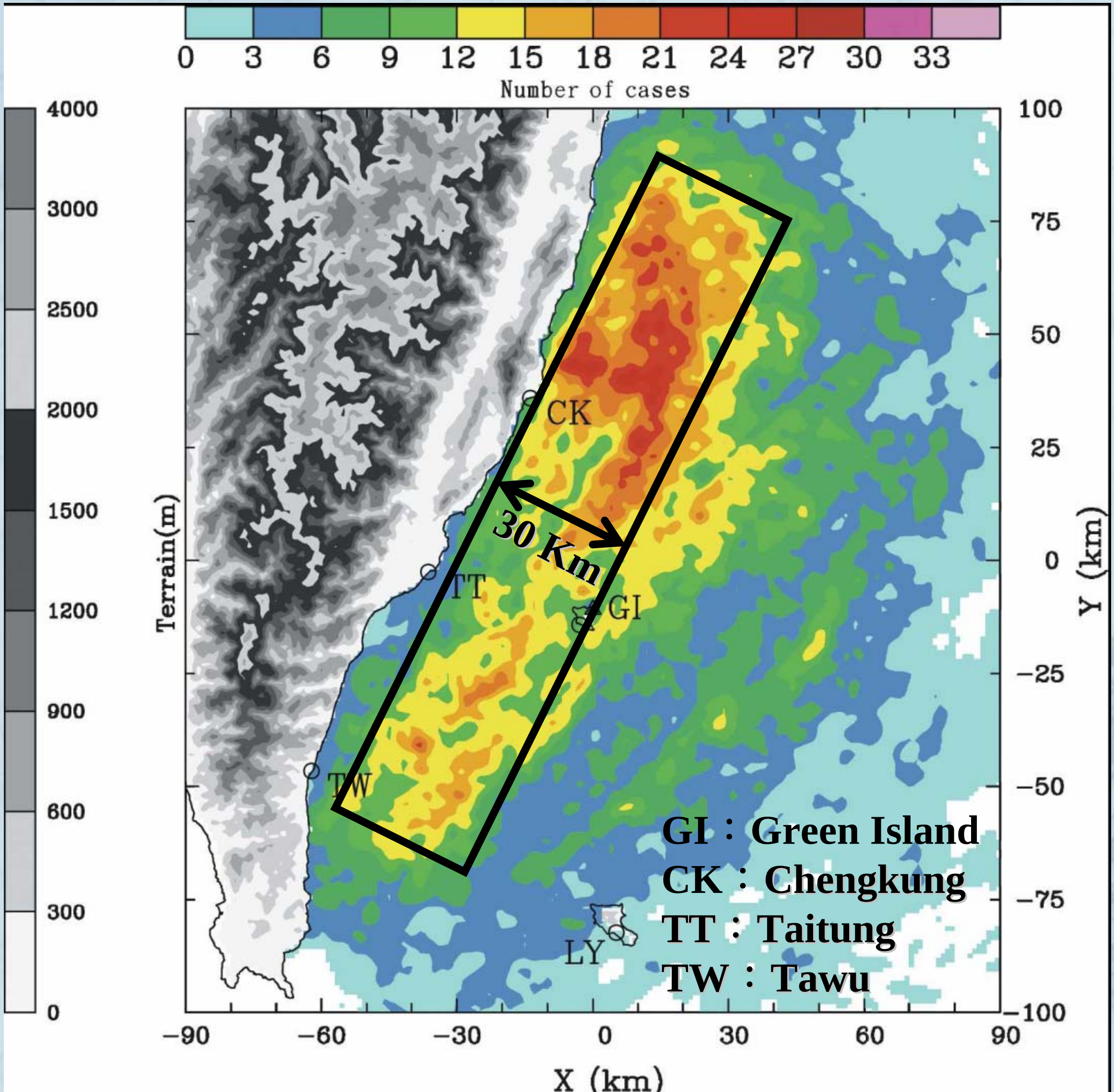
On average, five convective lines occur per month off the southeastern coast of Taiwan.

Low-level PPI scans of reflectivity (dBZ) from the GI radar from four selected cases of convective lines

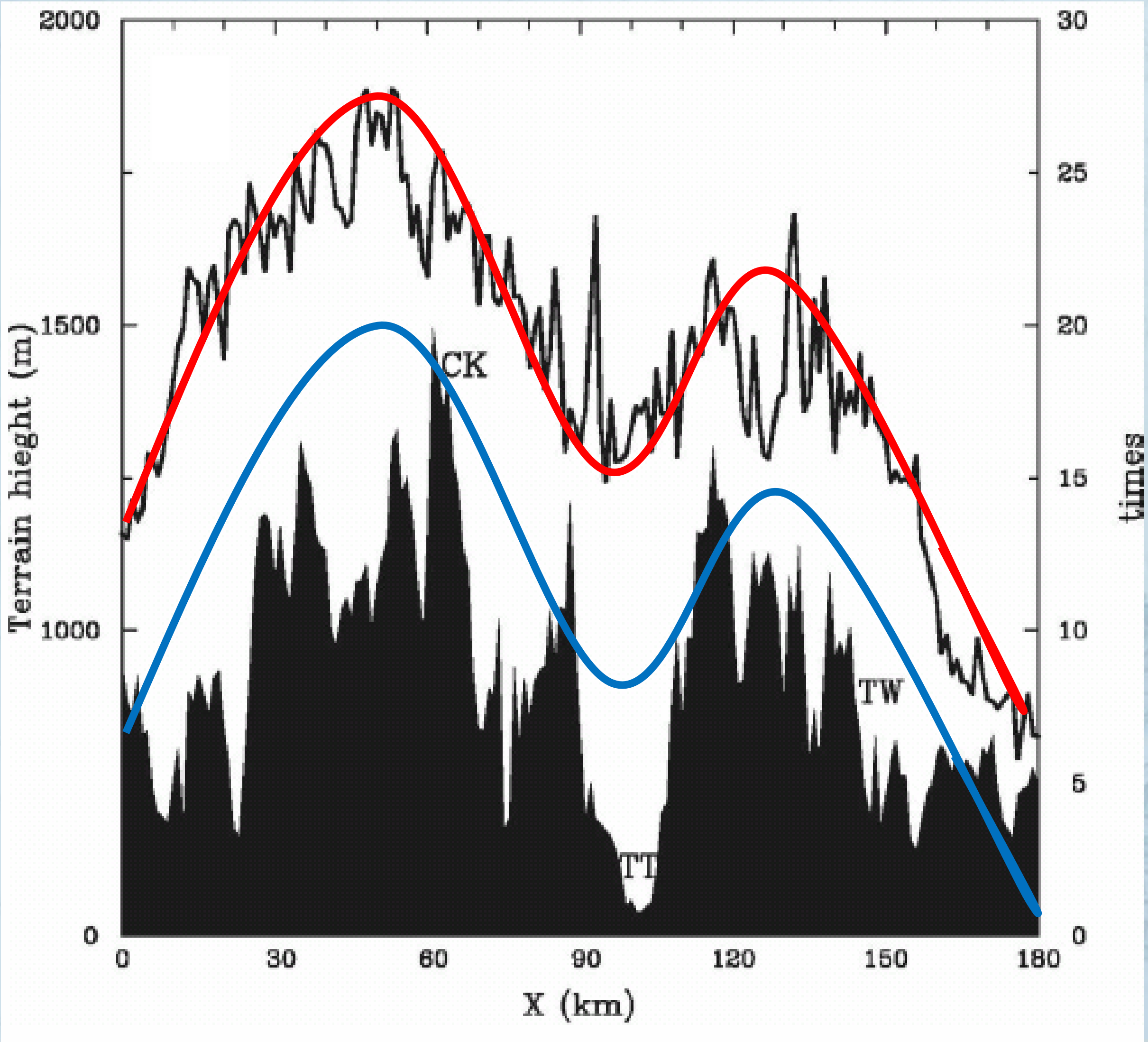


Statistics of all cases

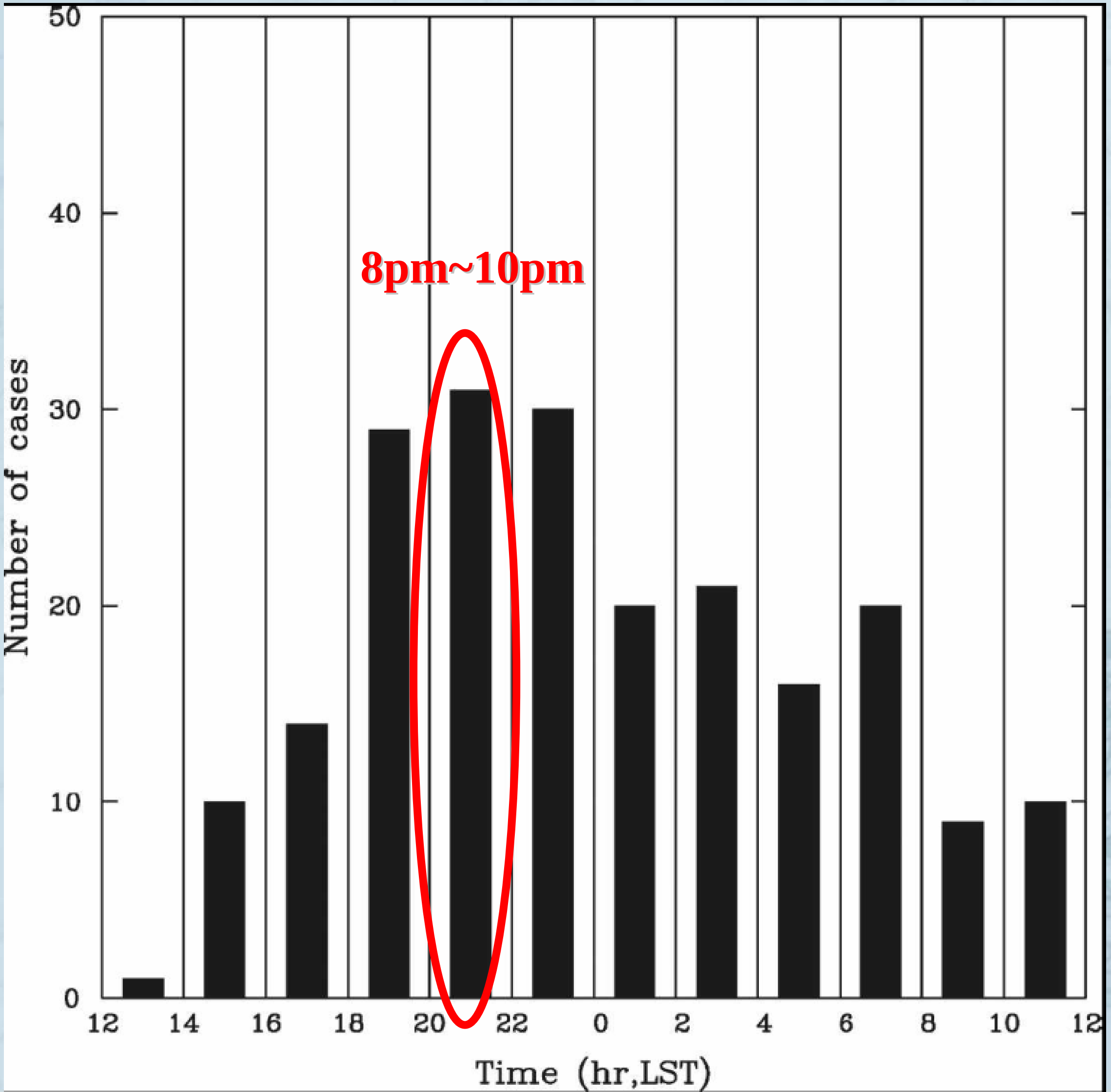
The spatial distribution of the formative frequency of convective lines occurring off the southeastern coast of Taiwan during 1998–2004



The relationship between the formative frequency of convective lines and the maximum coastal terrain height



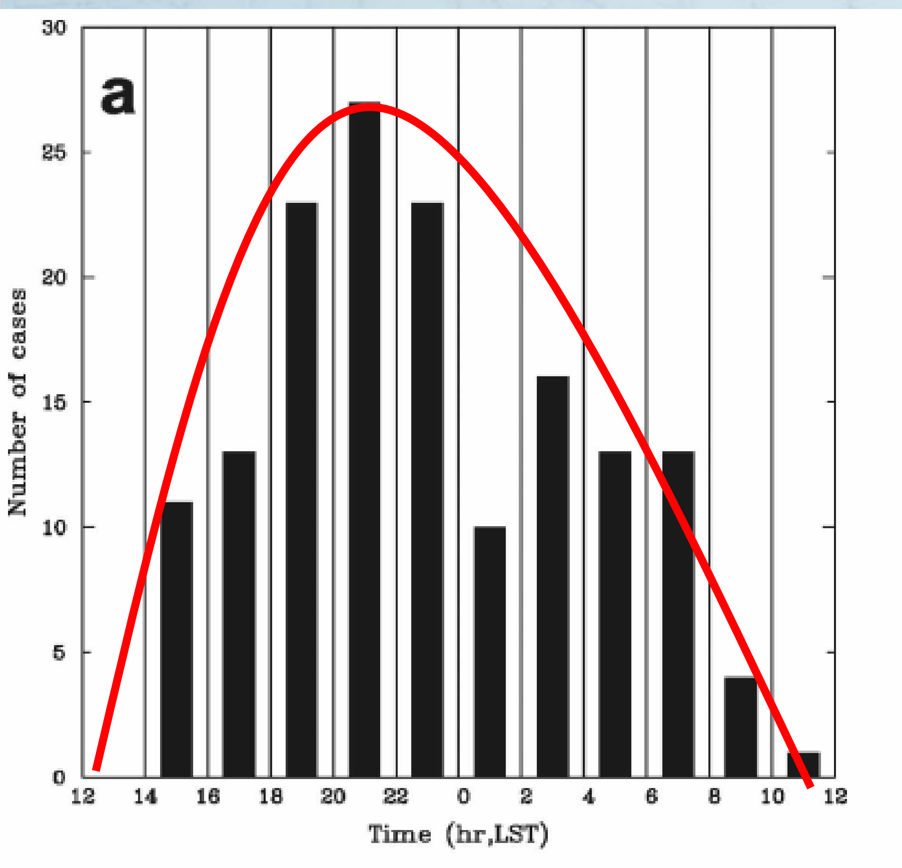
Number of cases of convective lines at different time intervals during a day for all 211 convective lines



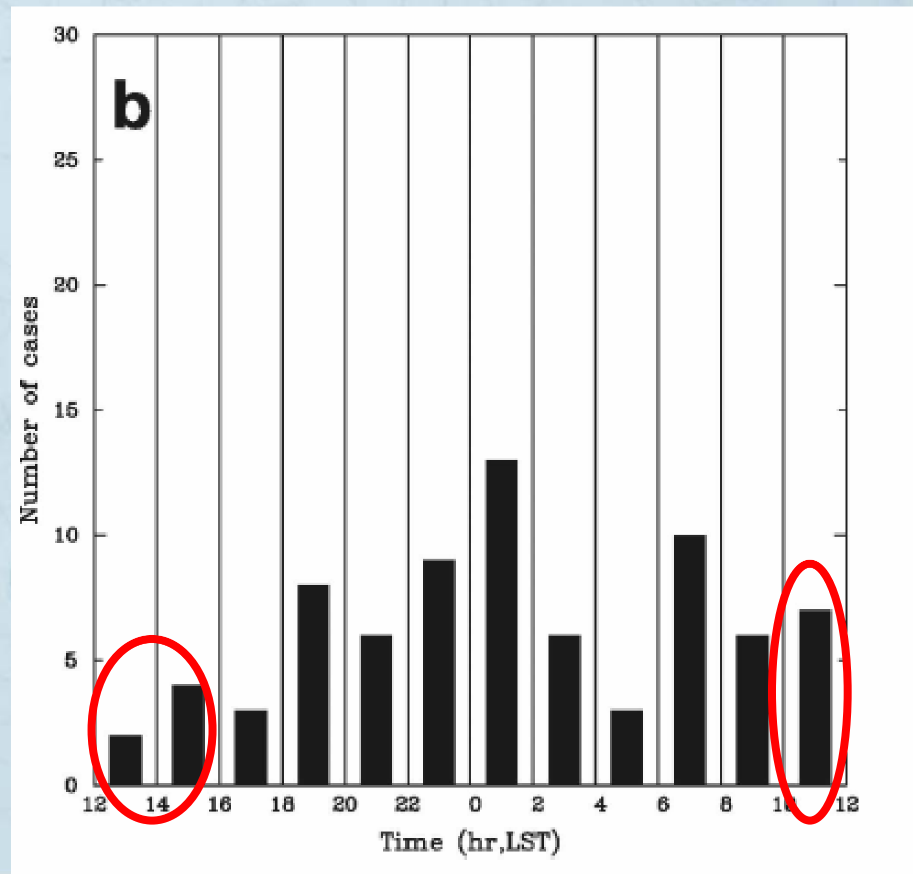
Nearshore and offshore convective lines

Number of nearshore(offshore) cases of convective lines at different time intervals

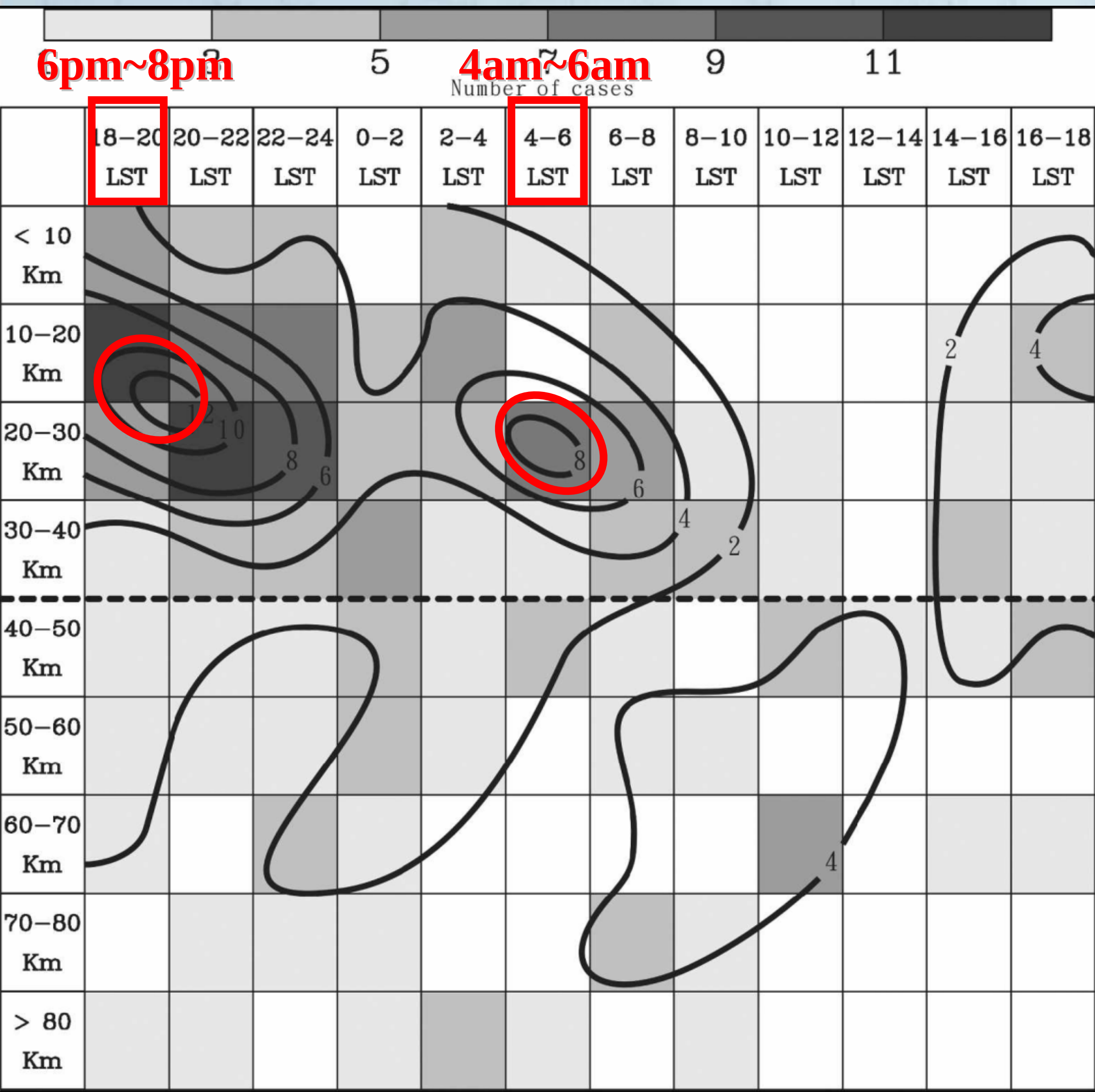
nearshore



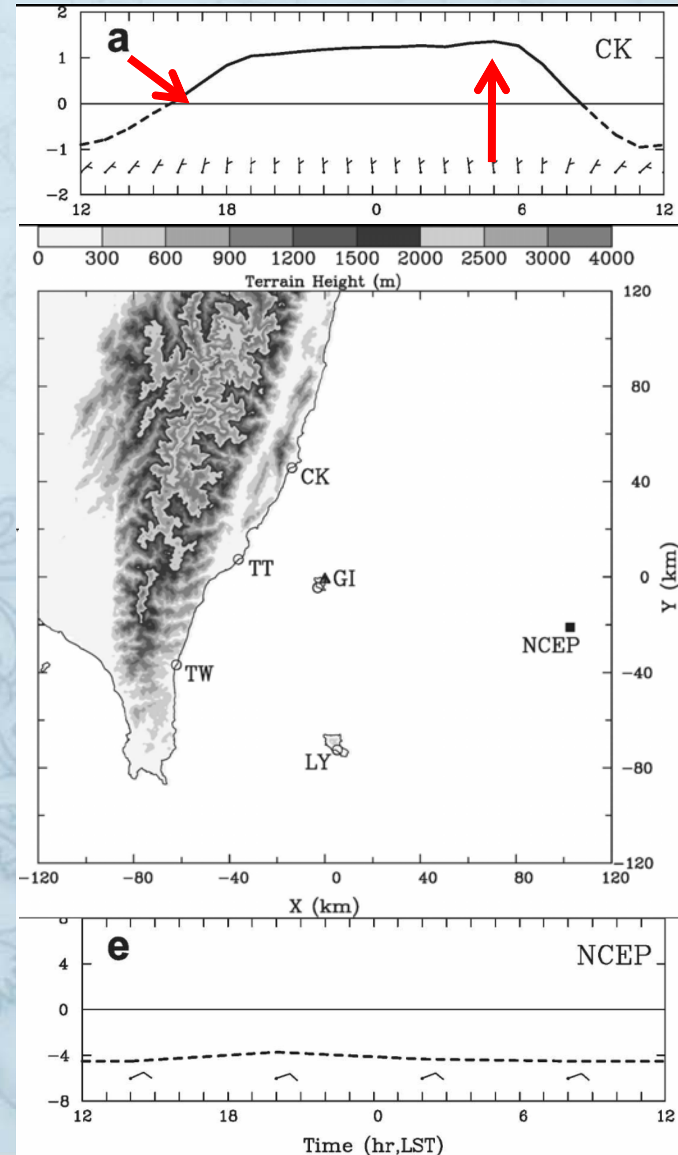
offshore



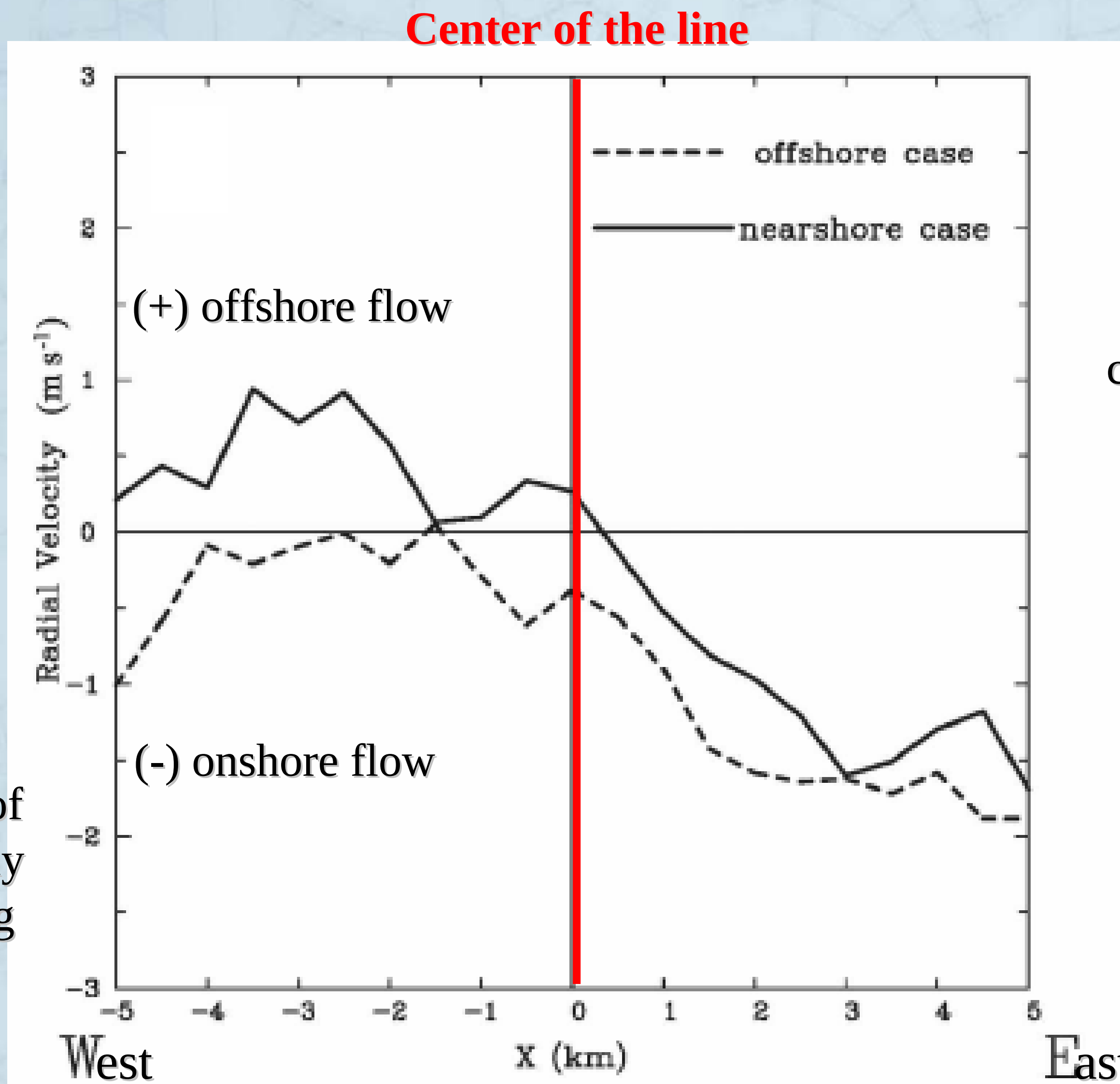
Distribution of formative frequencies of the convective lines over different time intervals and offshore distances



Time series of mean surface winds during the formative days of the convective lines



Composite low-level radial velocities within the nearshore and offshore convective lines



There is a convergence in the center of the nearshore line

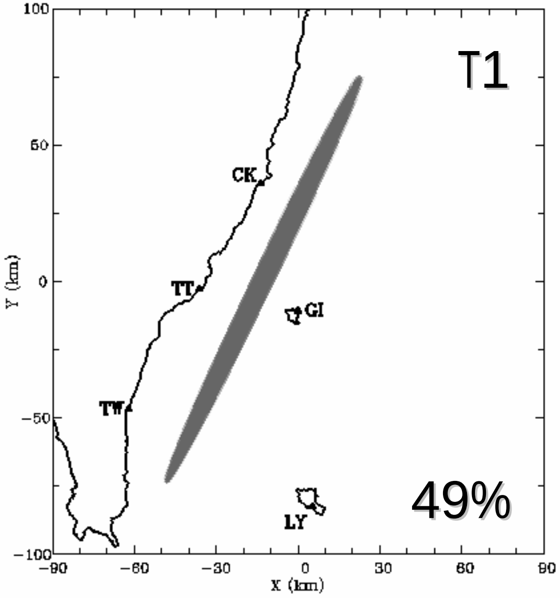
The deceleration of onshore flow imply upstream blocking condition

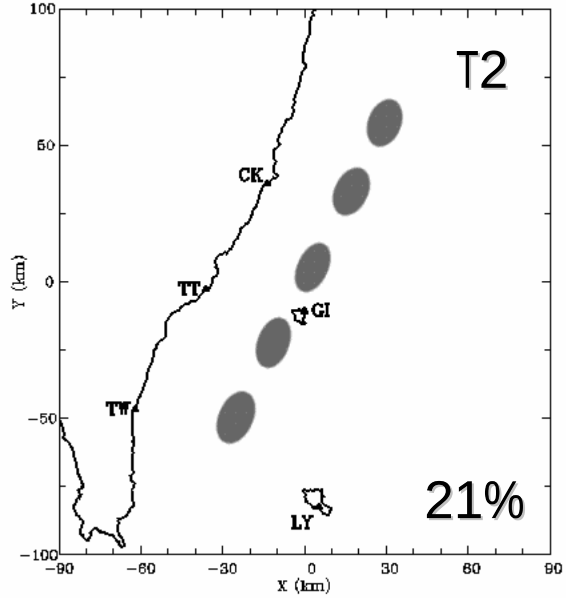
Conclusions

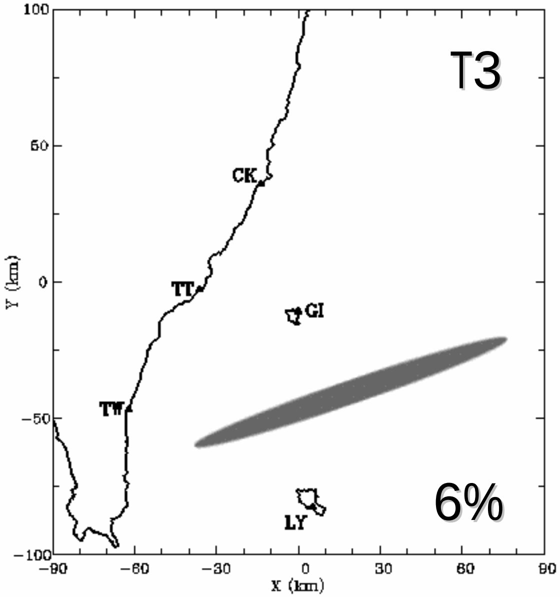
- Investigation of the spatial distribution of the formation for the 211 selected lines revealed that the area of the most frequent formation was located ~30 km off the southeastern coast of Taiwan.

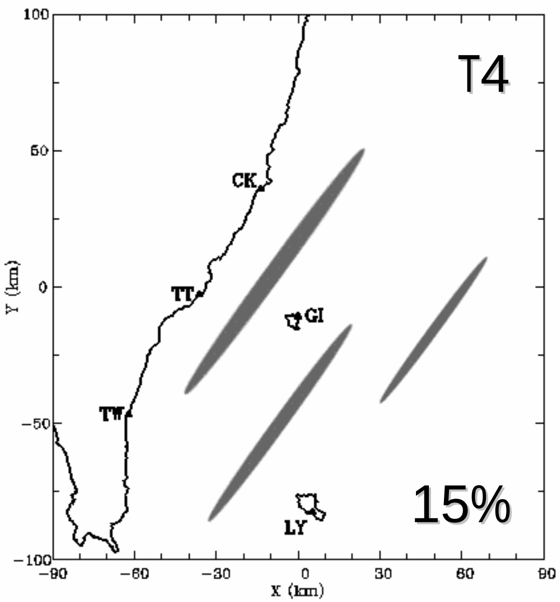
- A peak of line's formation is located nearshore adjacent to the highest mountain near the Chengkung station, because of its stronger offshore flow due to terrain effects.

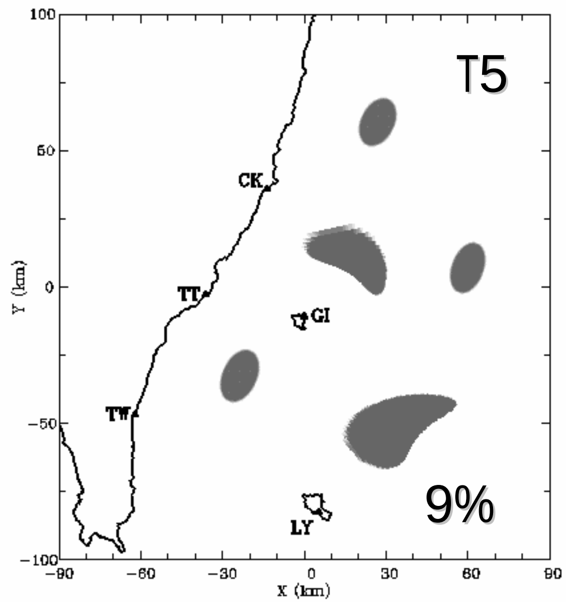
- The formation of the nearshore lines was closely related to the low-level convergence produced as coastal offshore flow encountered the prevailing onshore flow. The deceleration of the prevailing onshore flow due to upstream blocking appeared to be a major cause of offshore line's formation.











There are 465 cases of convective activities selected from 1998 to 2004

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Thanks for your listening