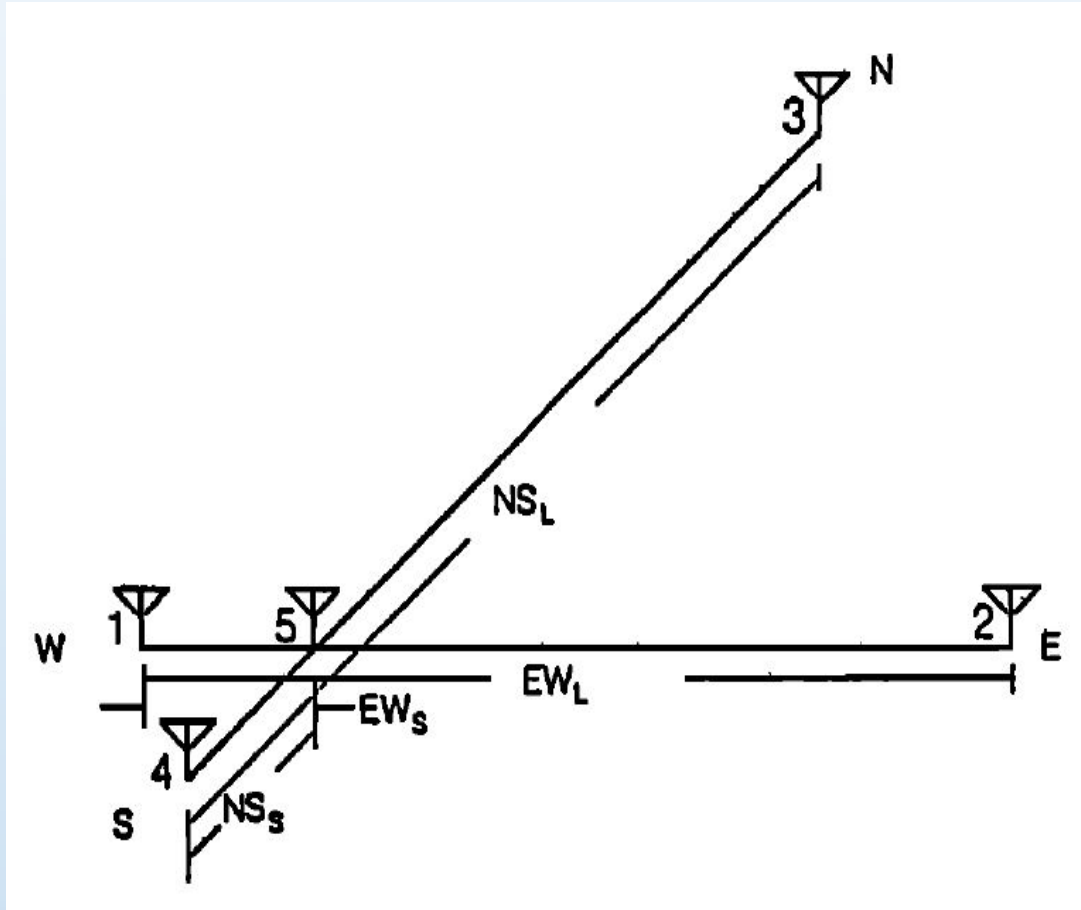


# Observations of Lightning Phenomena using Radio Interferometry

C. T. Rhodes, X. M. Shao, P. R. Krehbiel, R.J. Thomas, and C. O. Hayenga

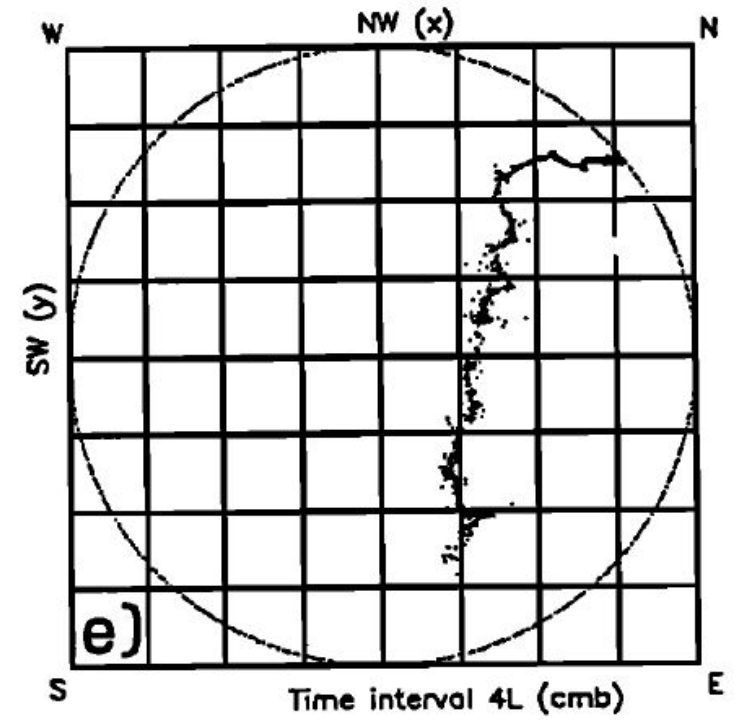
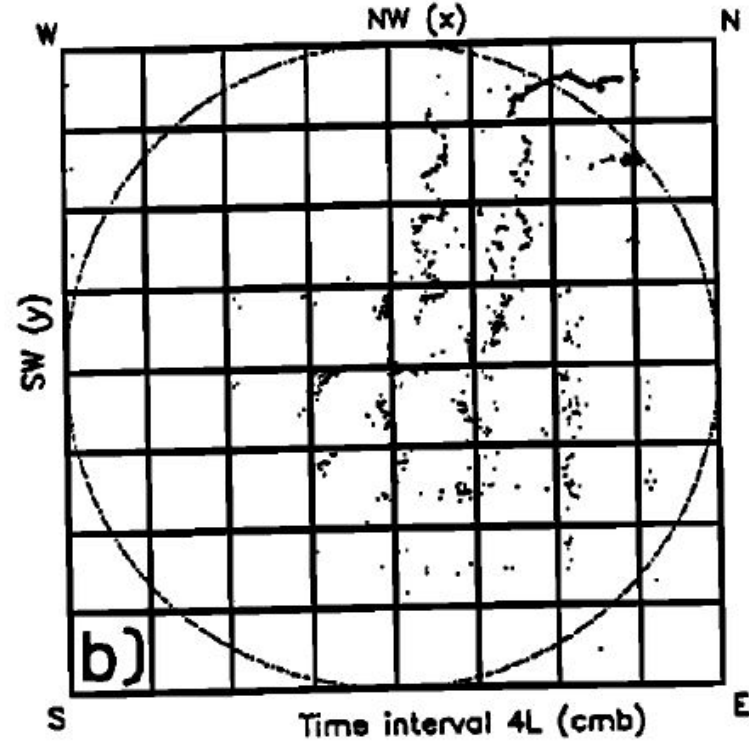
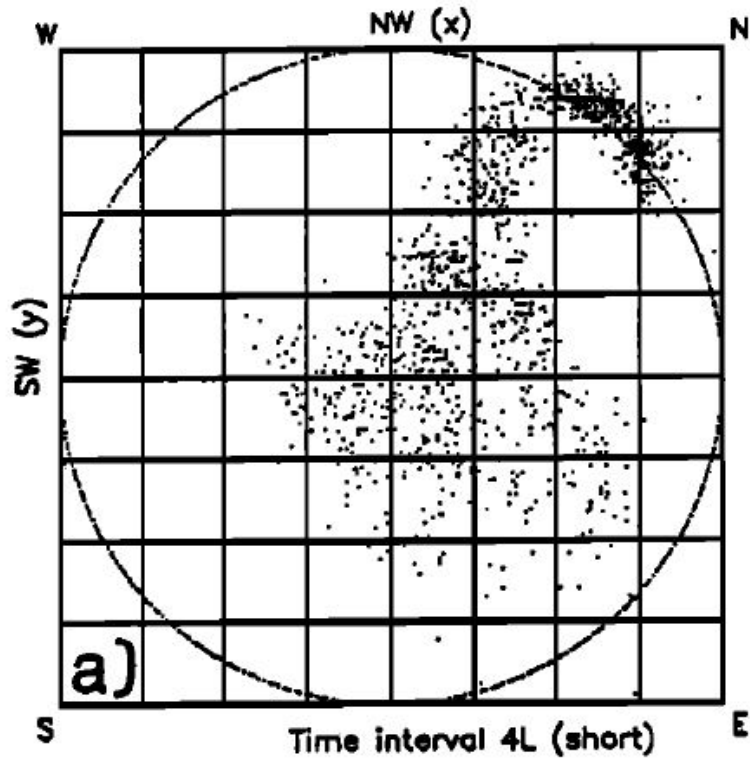
Presented by: Miguel Bernardez

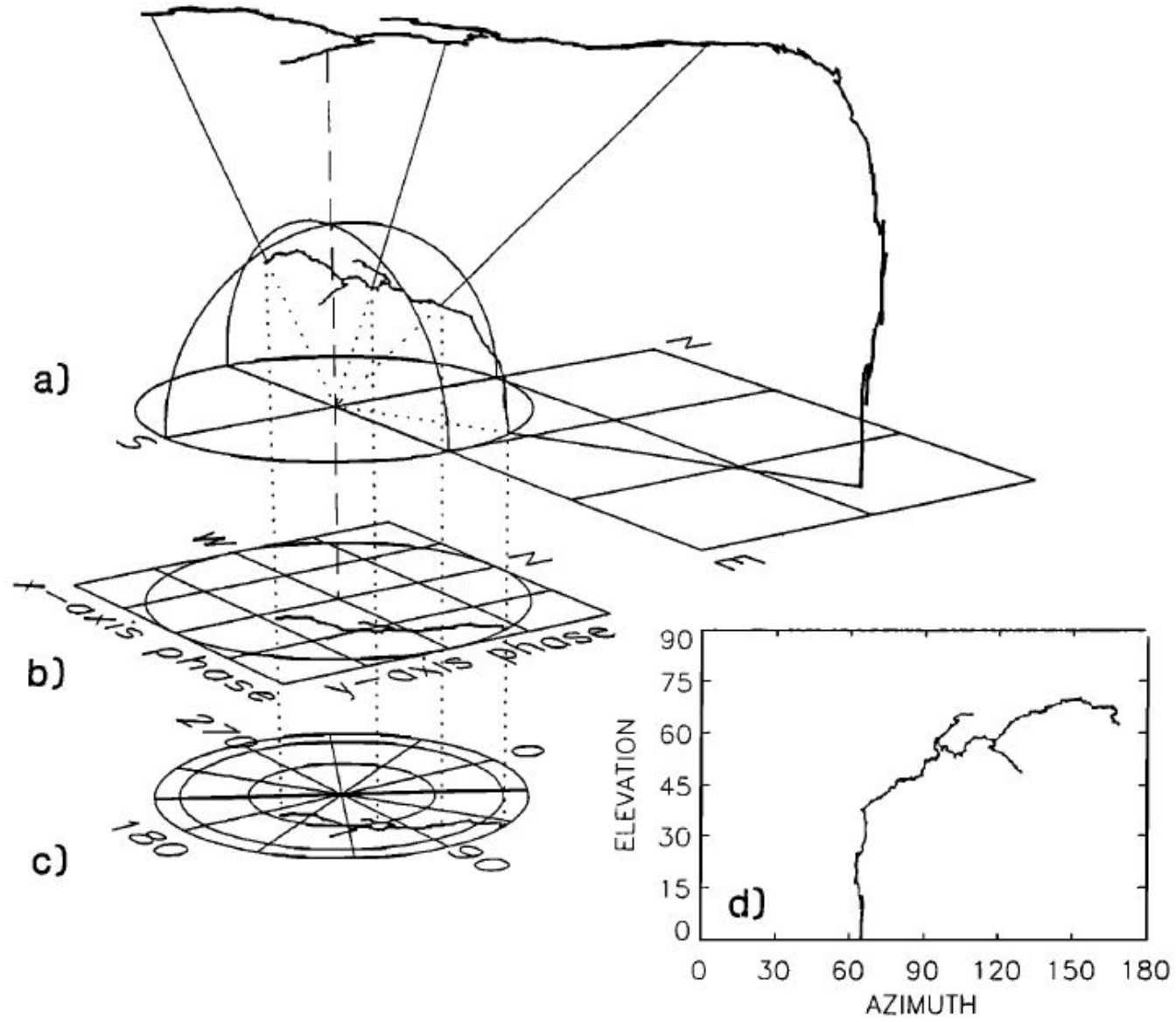
# Interferometer Design



- The interferometer uses 2 orthogonal baselines
- One is long and provides accurate angular resolution
- The other is small and removes phase ambiguities
- The long arm acts like an hour hand
- The short arm is the minute hand

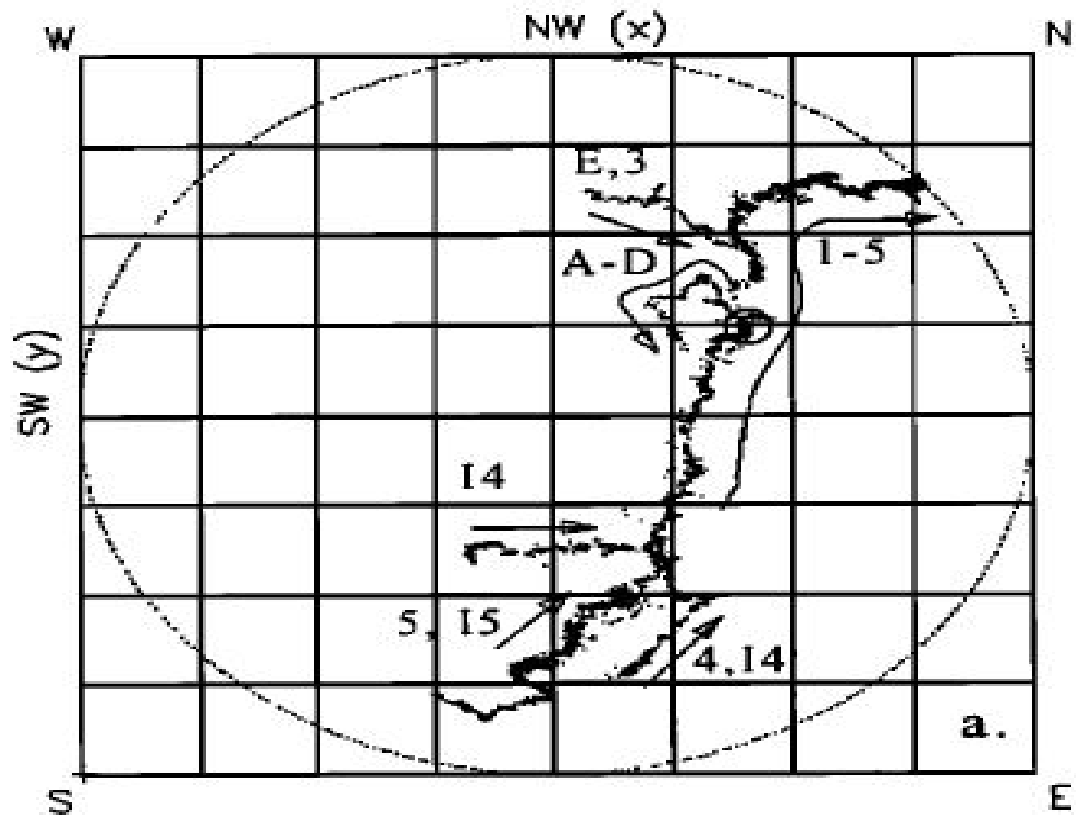
# Combining the short and long baselines



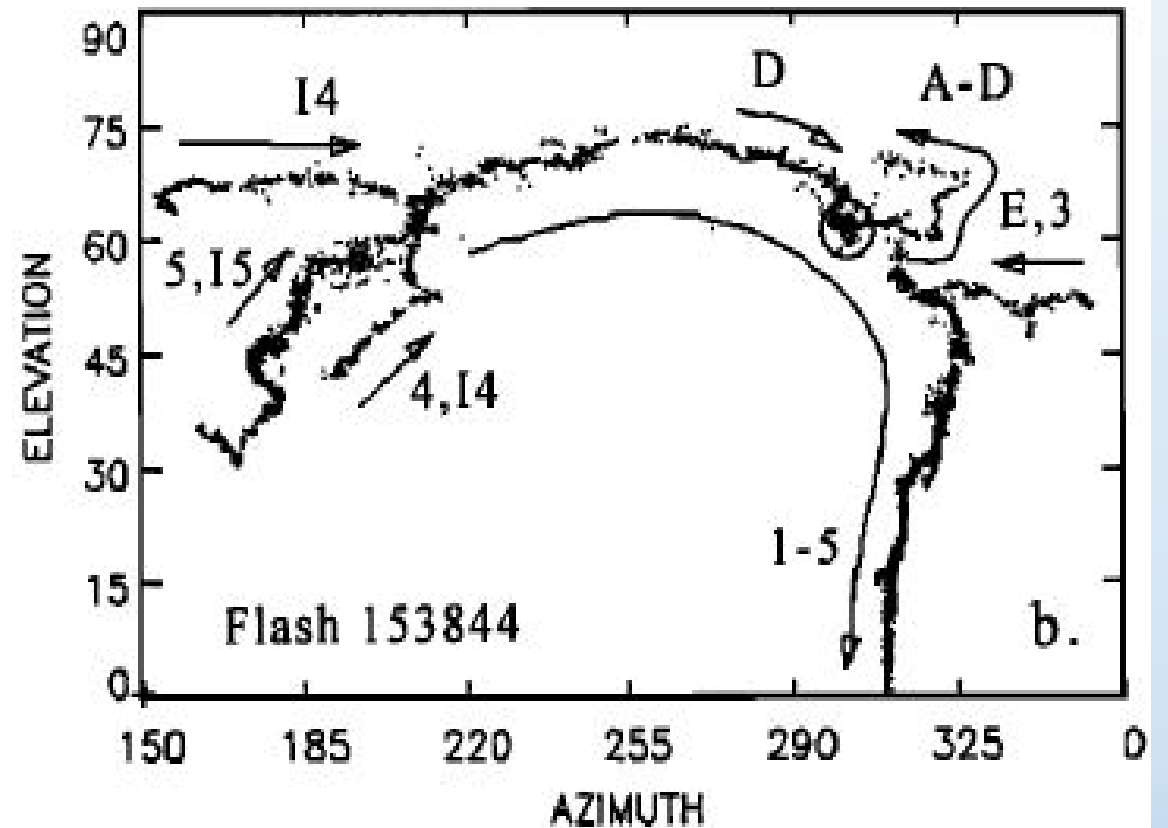


# Flash 153844 From August 23 1988

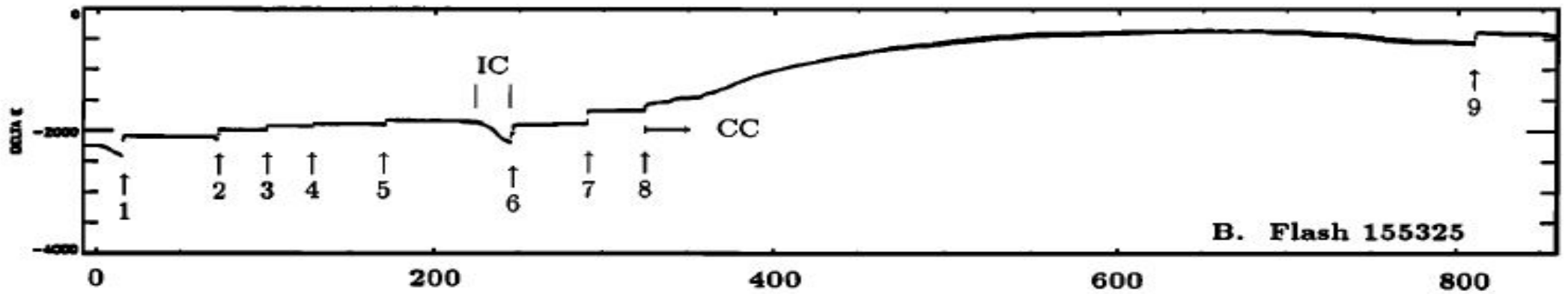
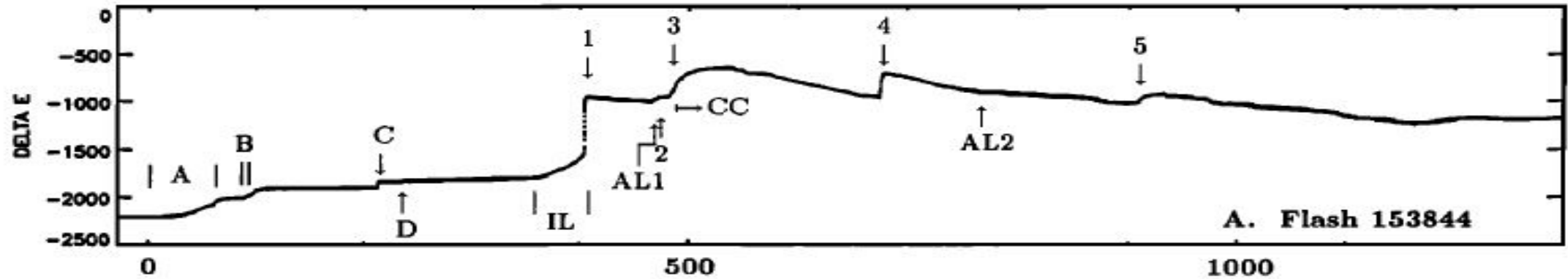
## Projection Plane



## Azimuth and Elevation

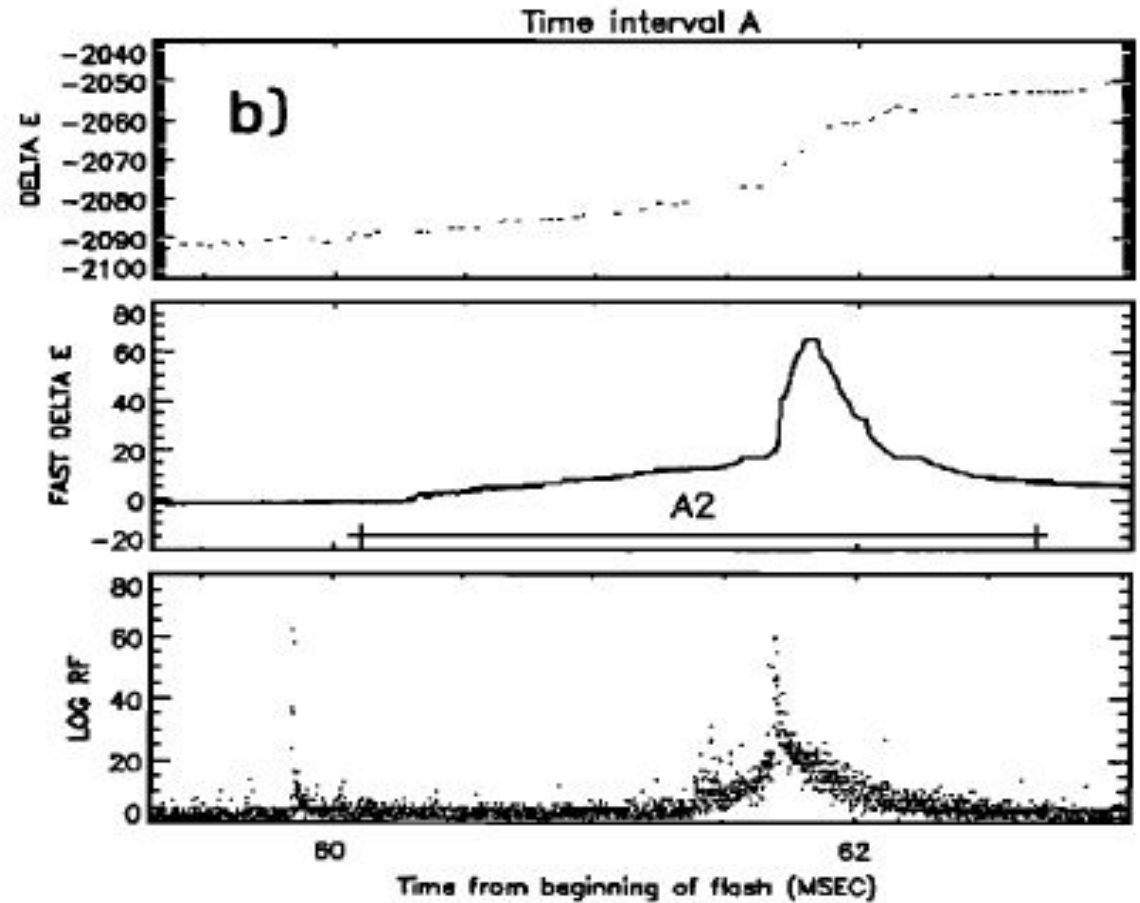
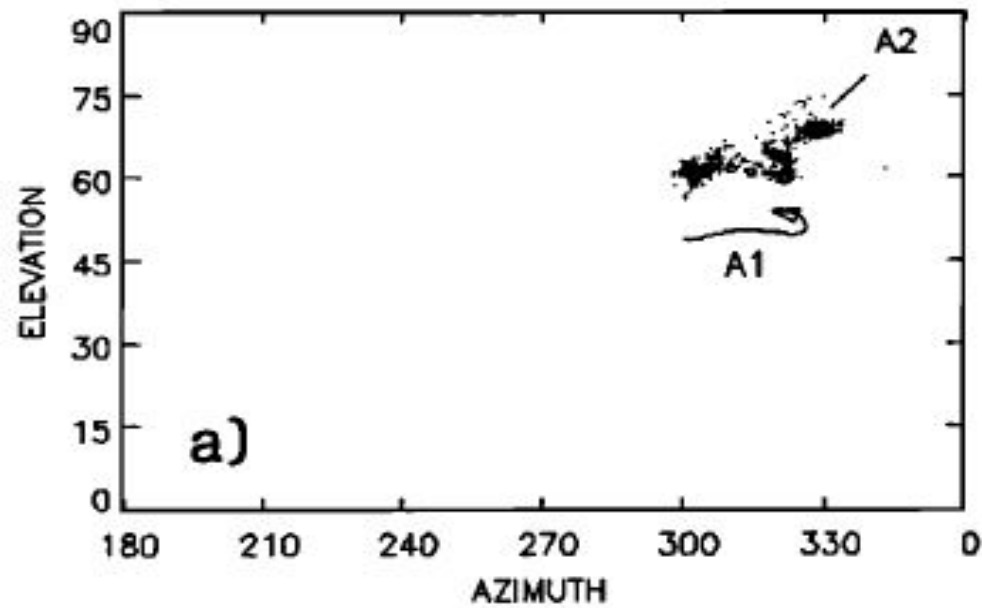


# Electric Field Changes

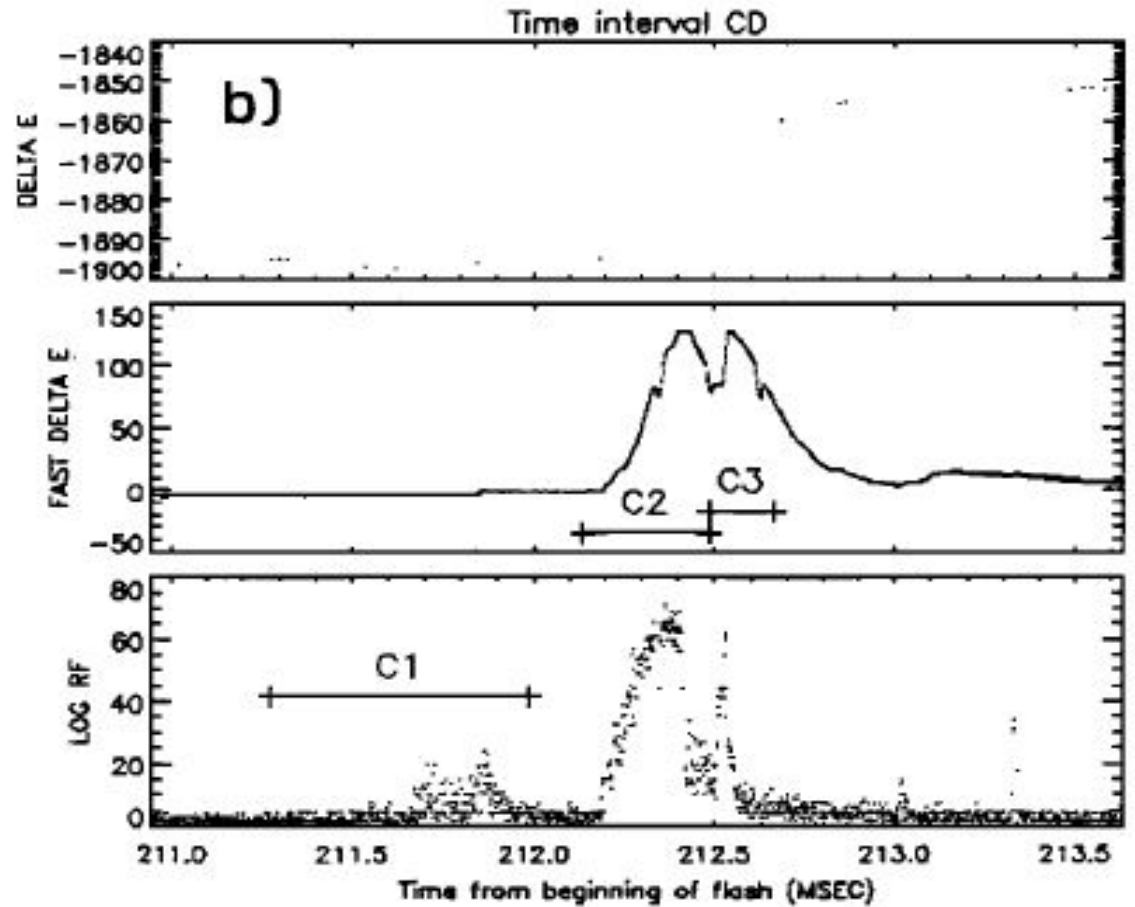
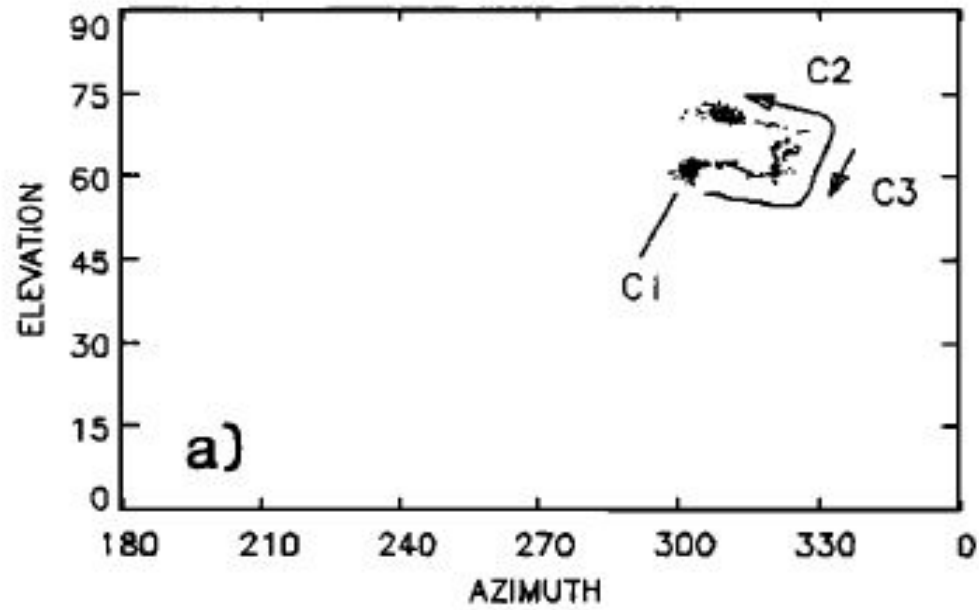


Time from Beginning of Flash. ms

# Initial Breakdown in the Cloud

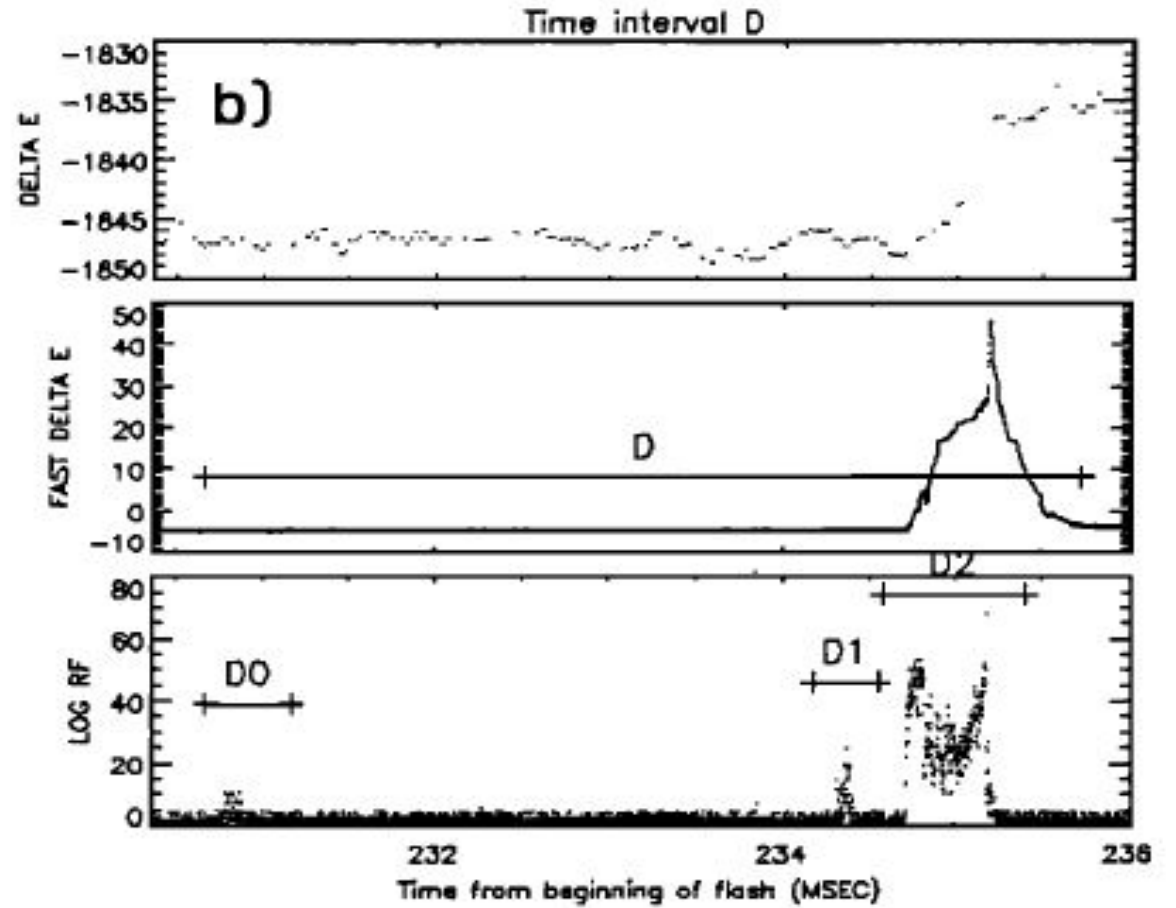
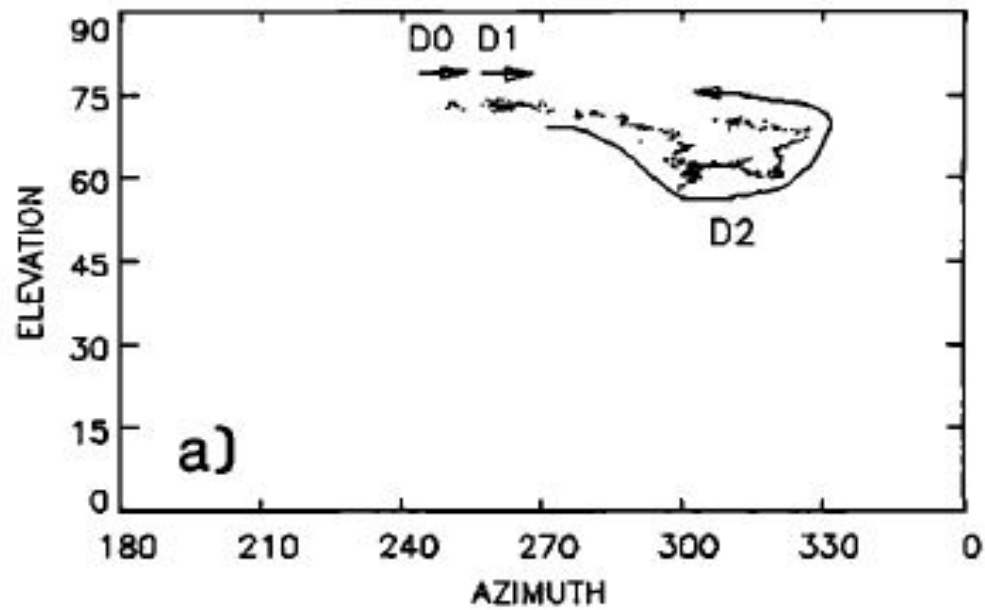


# First K-type event

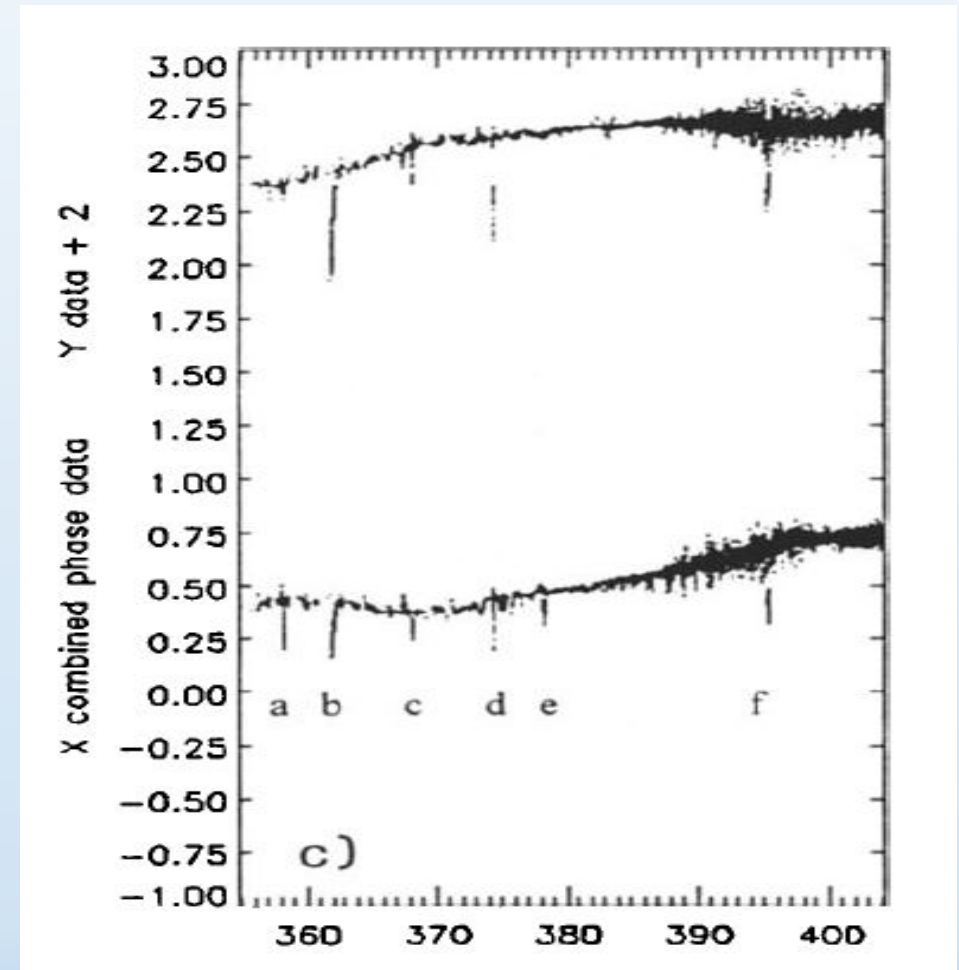
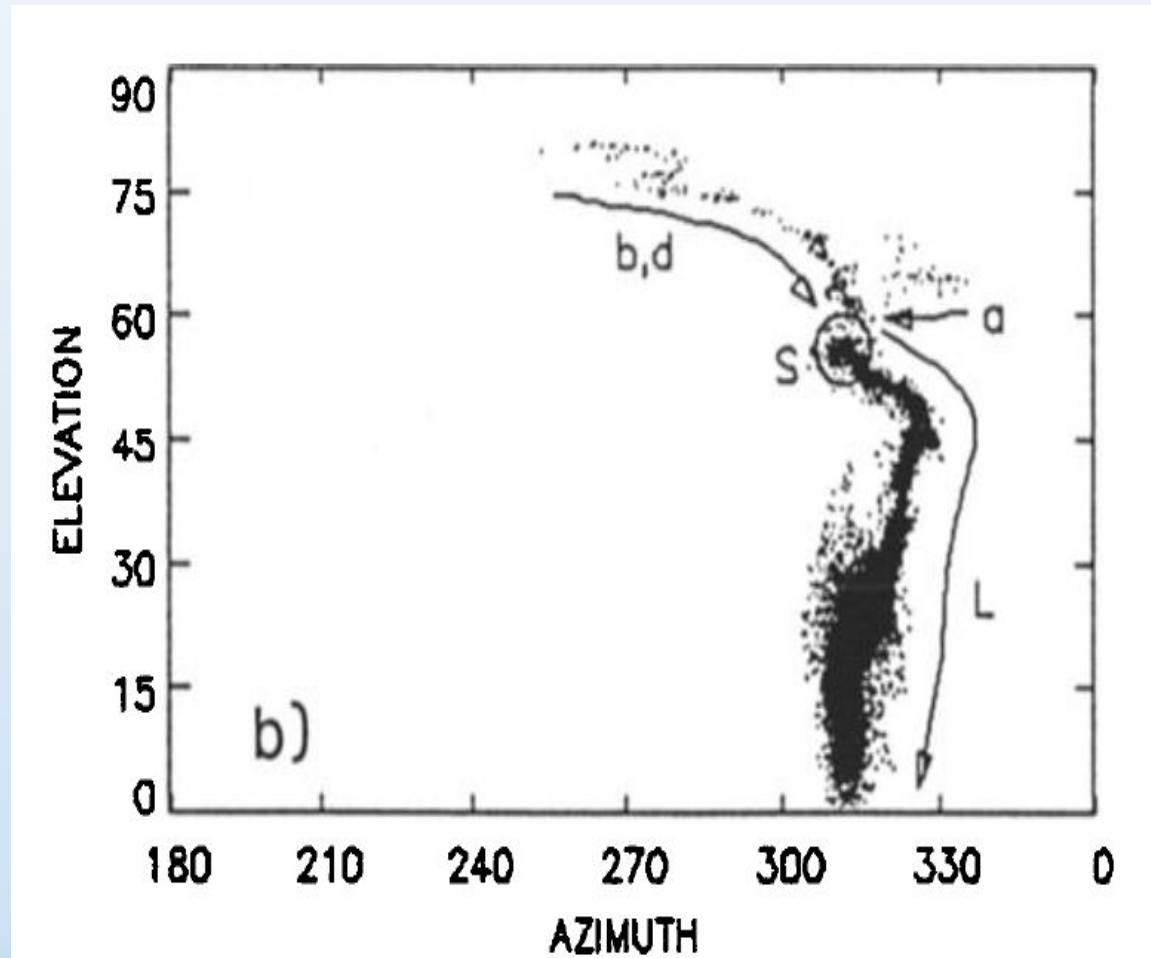




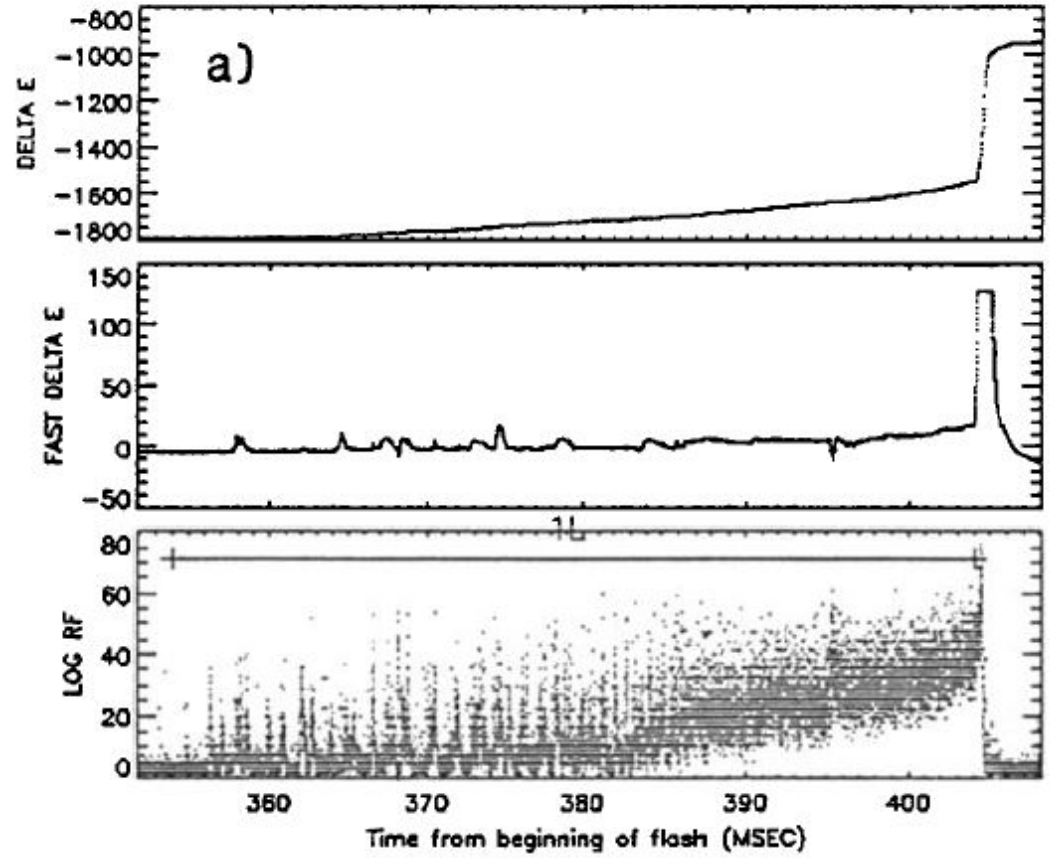
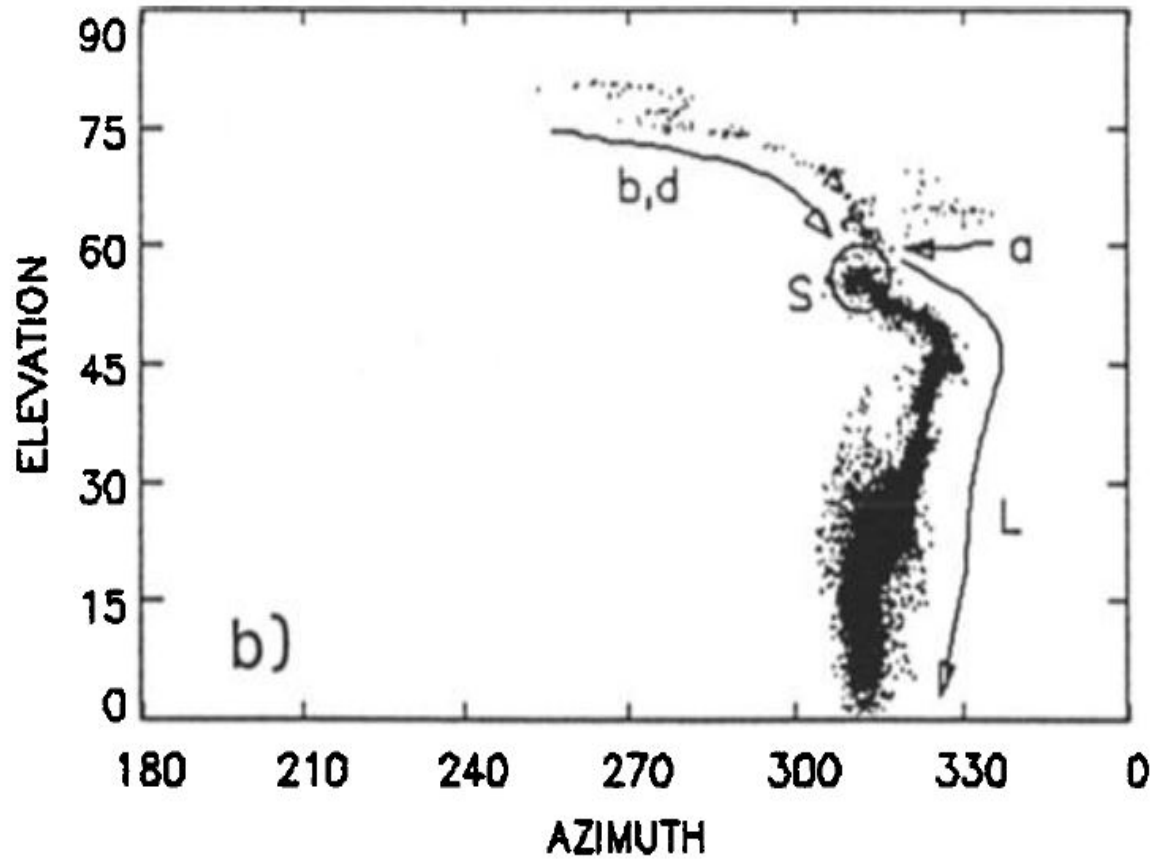
# Second K-type Event



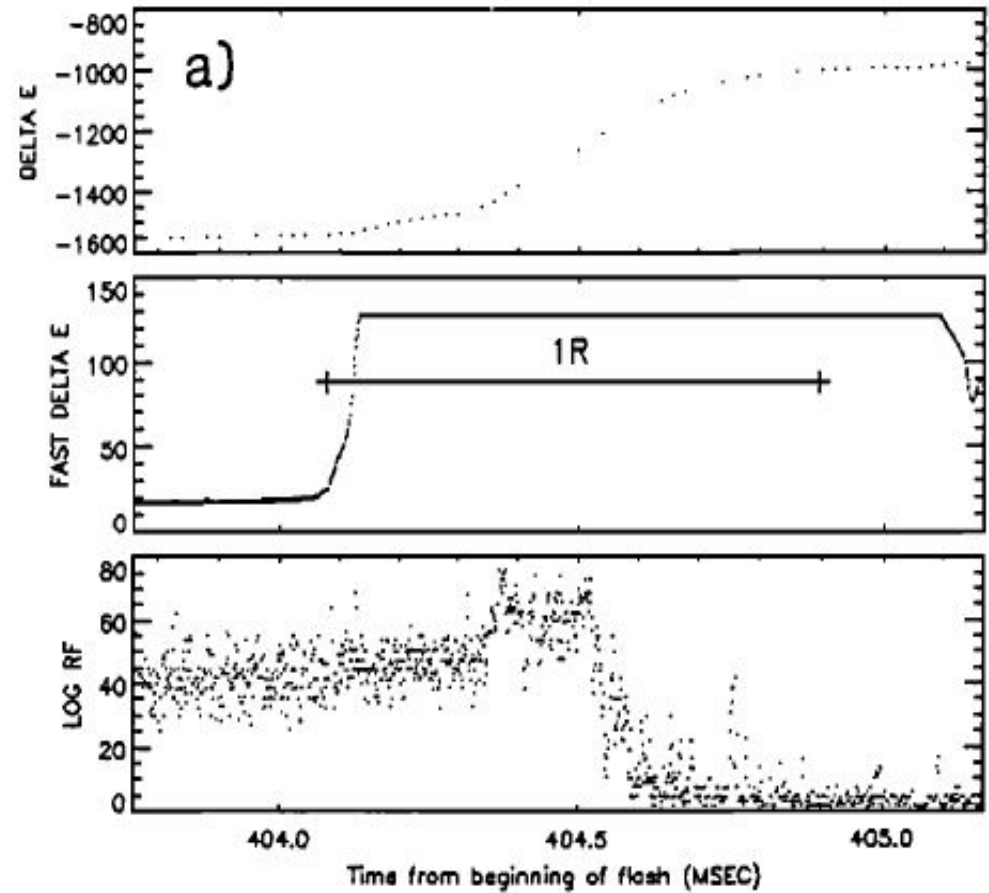
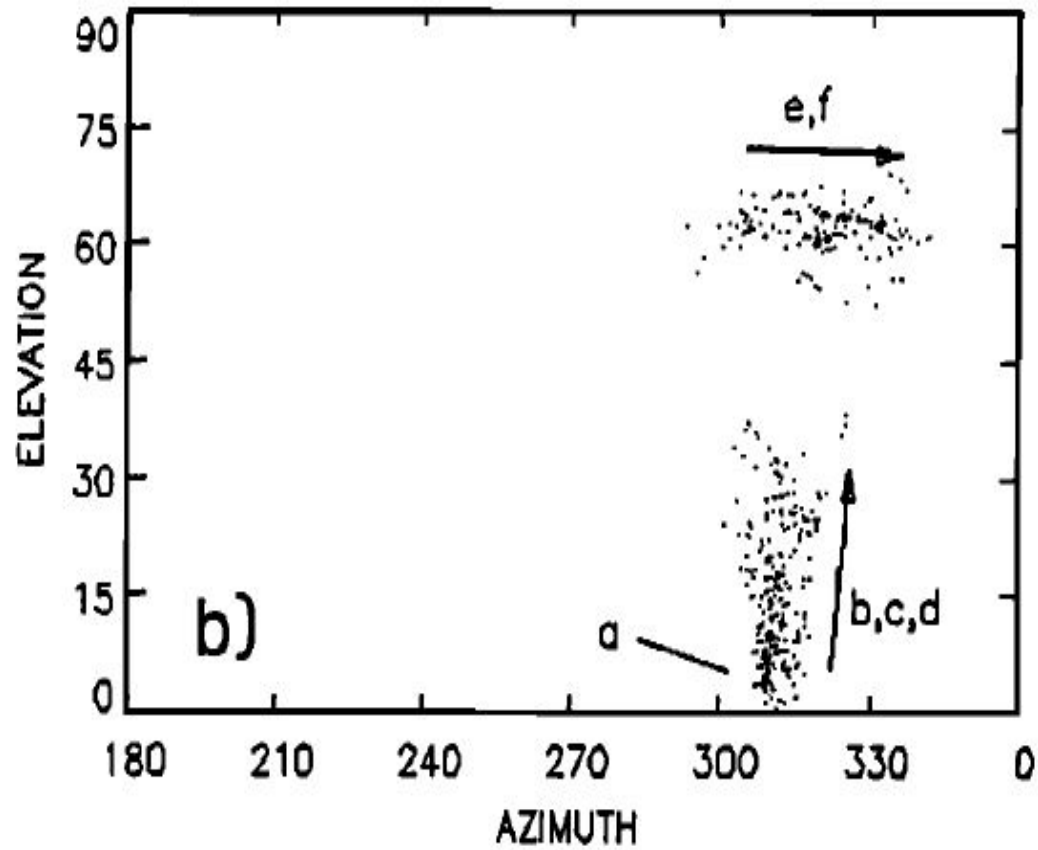
# First Leader to Ground



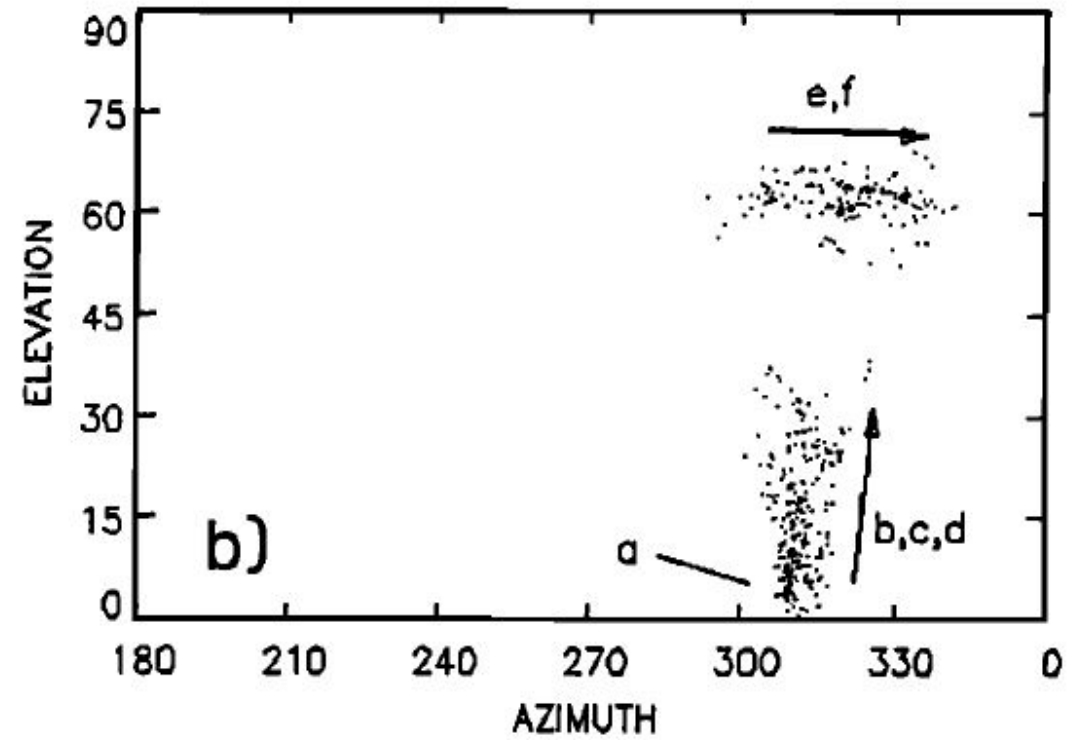
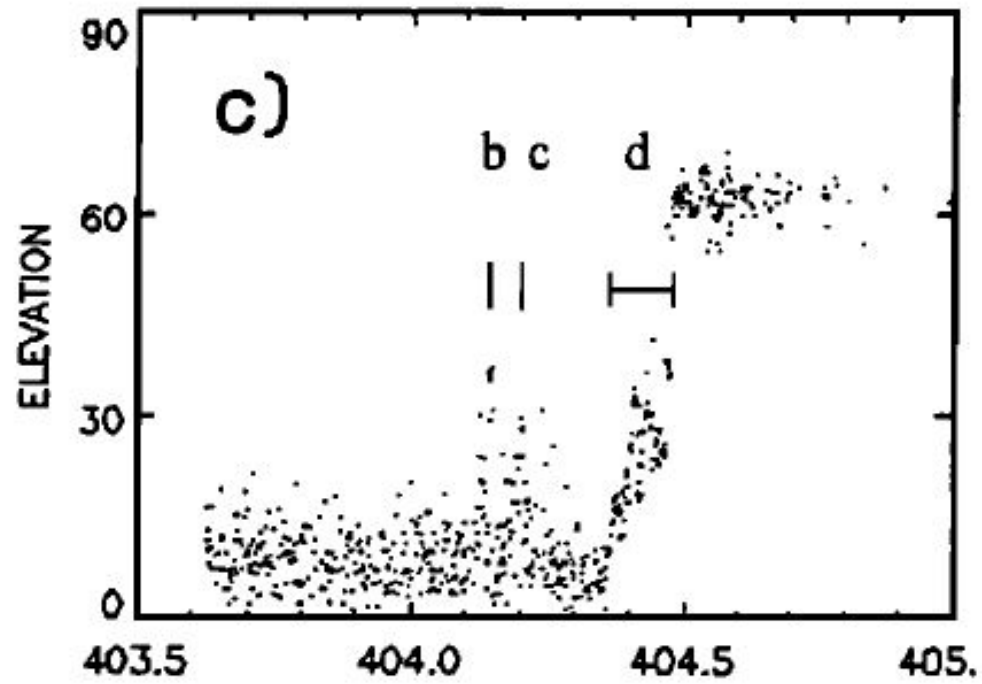
# First Leader to Ground



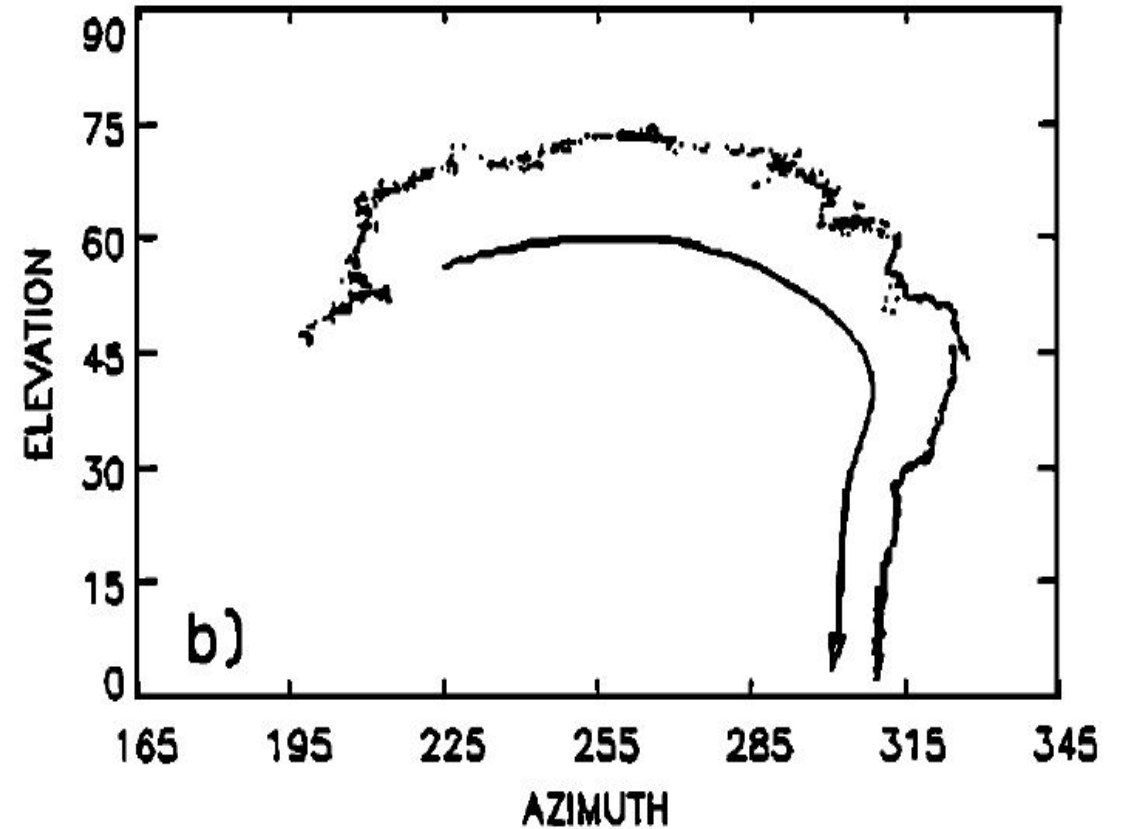
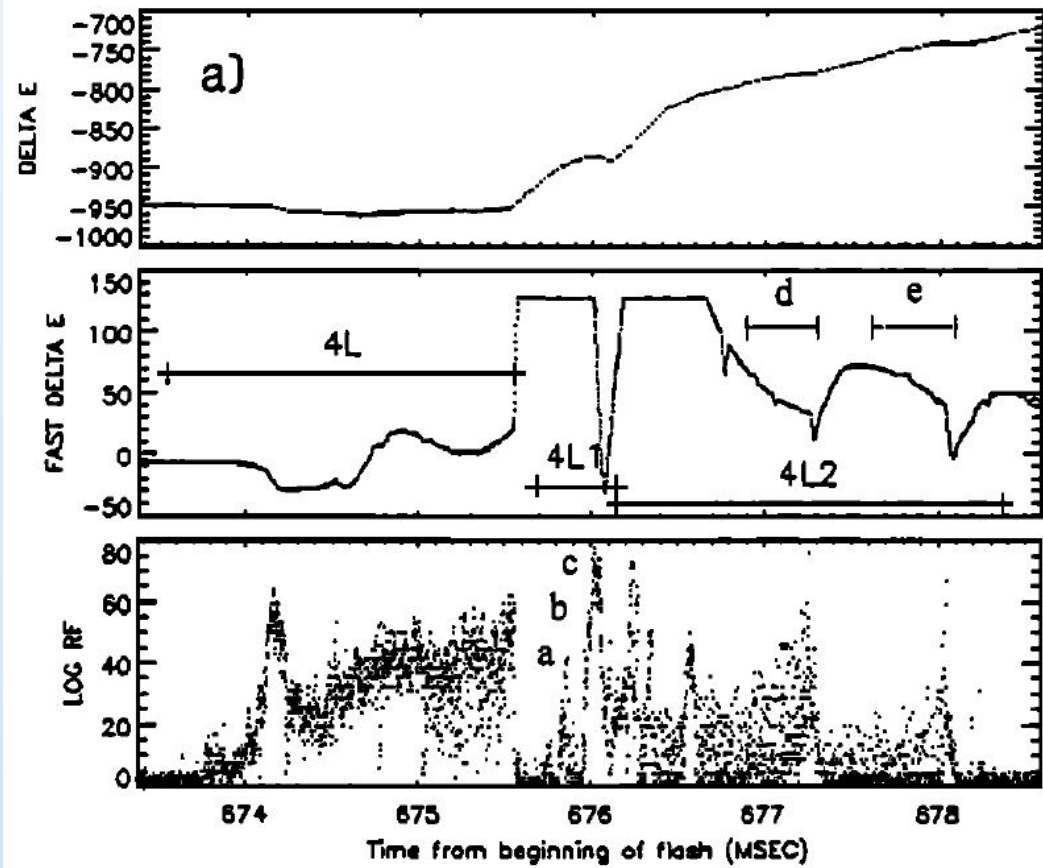
# First Return Stroke



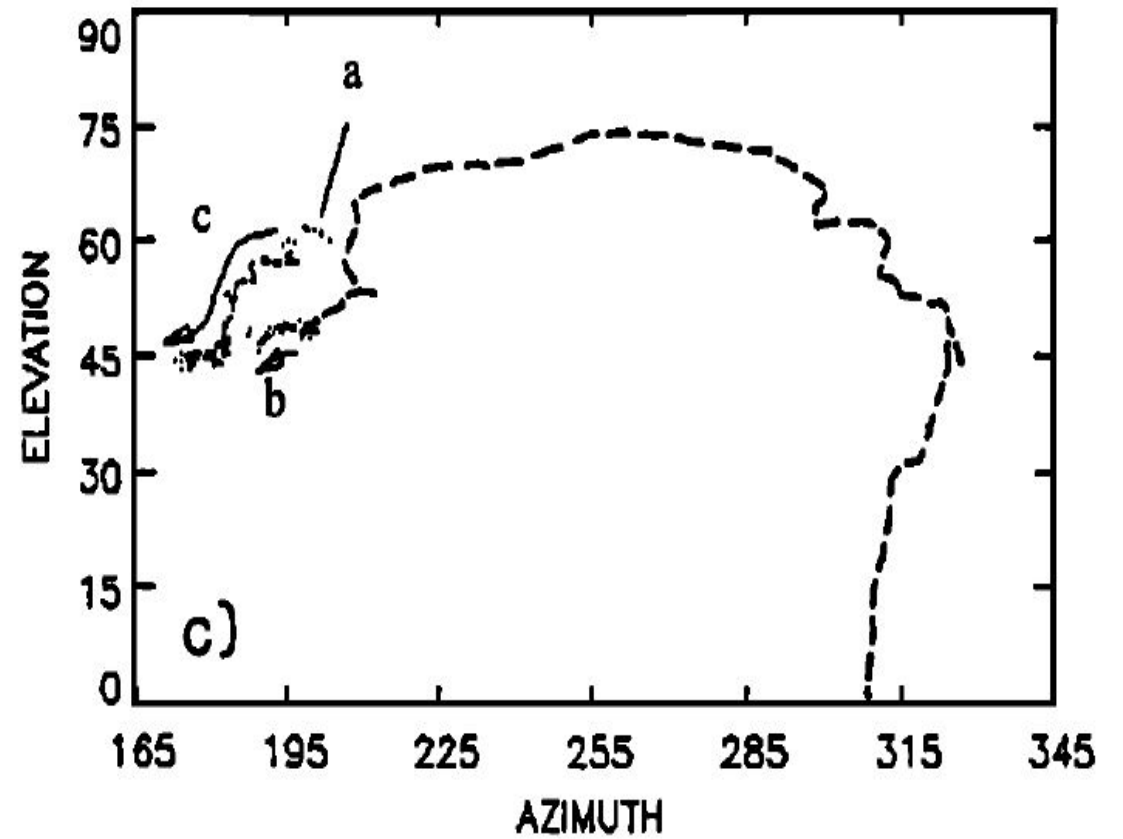
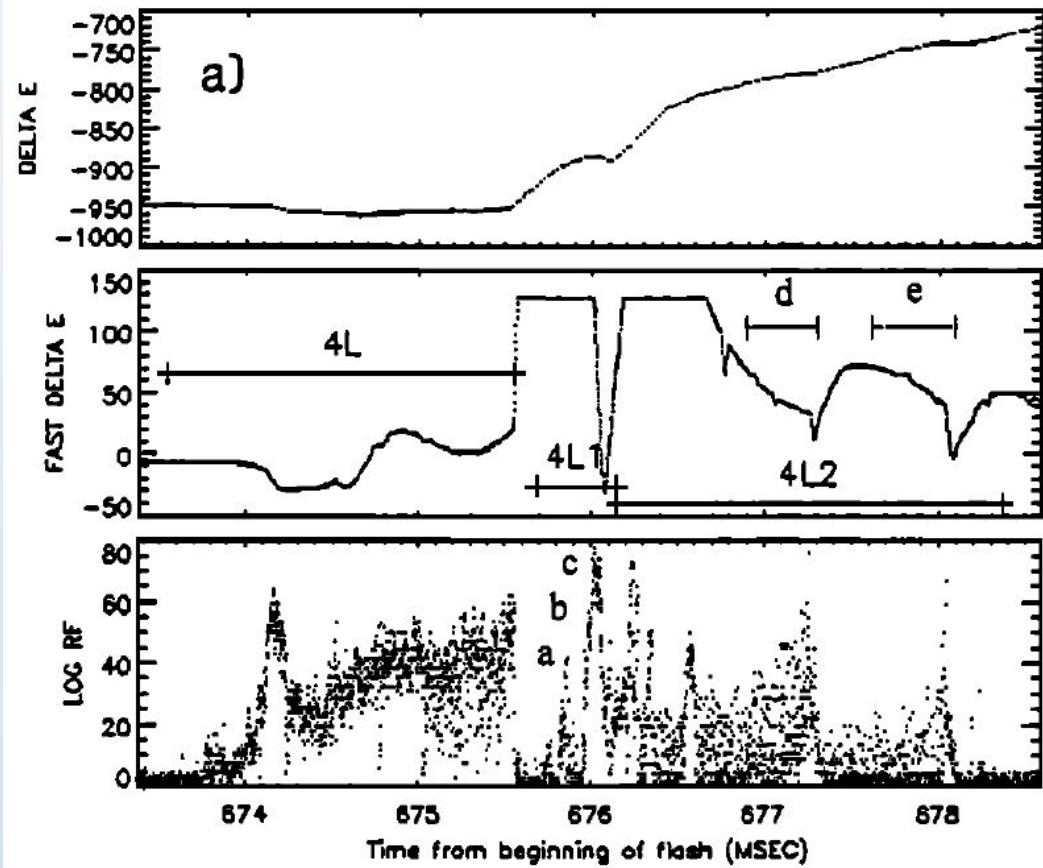
# First Return Stroke



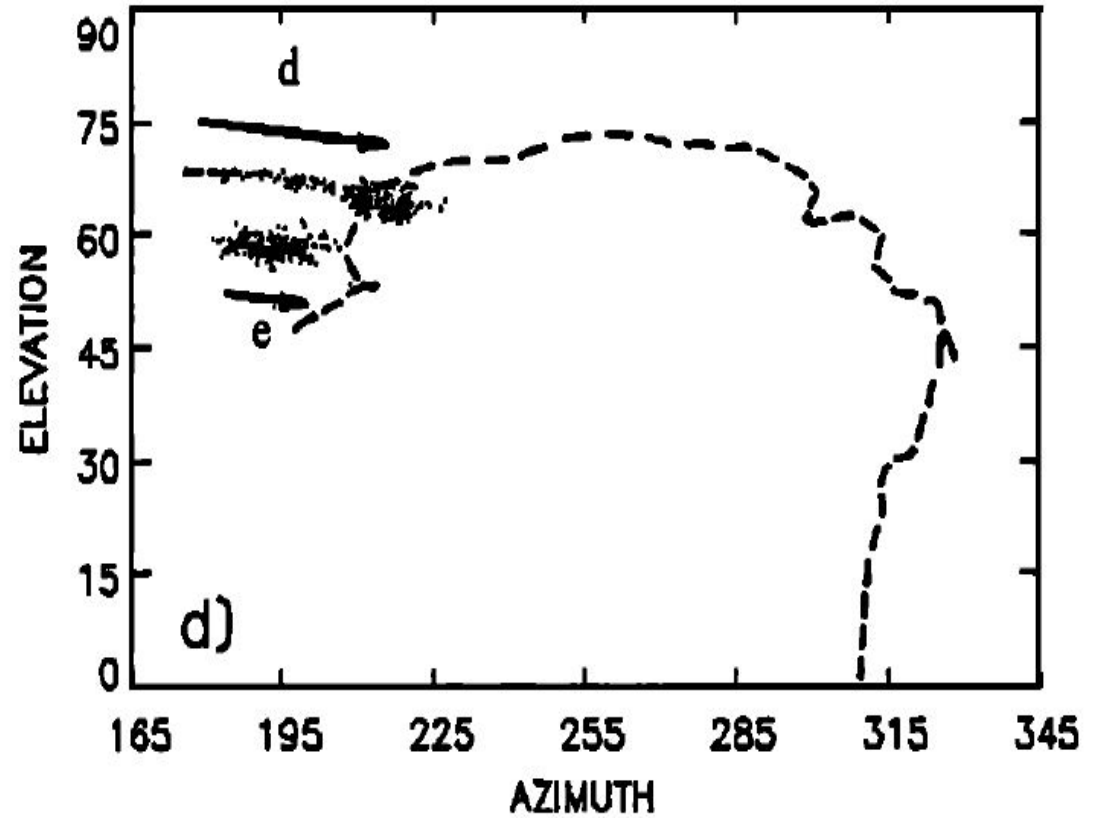
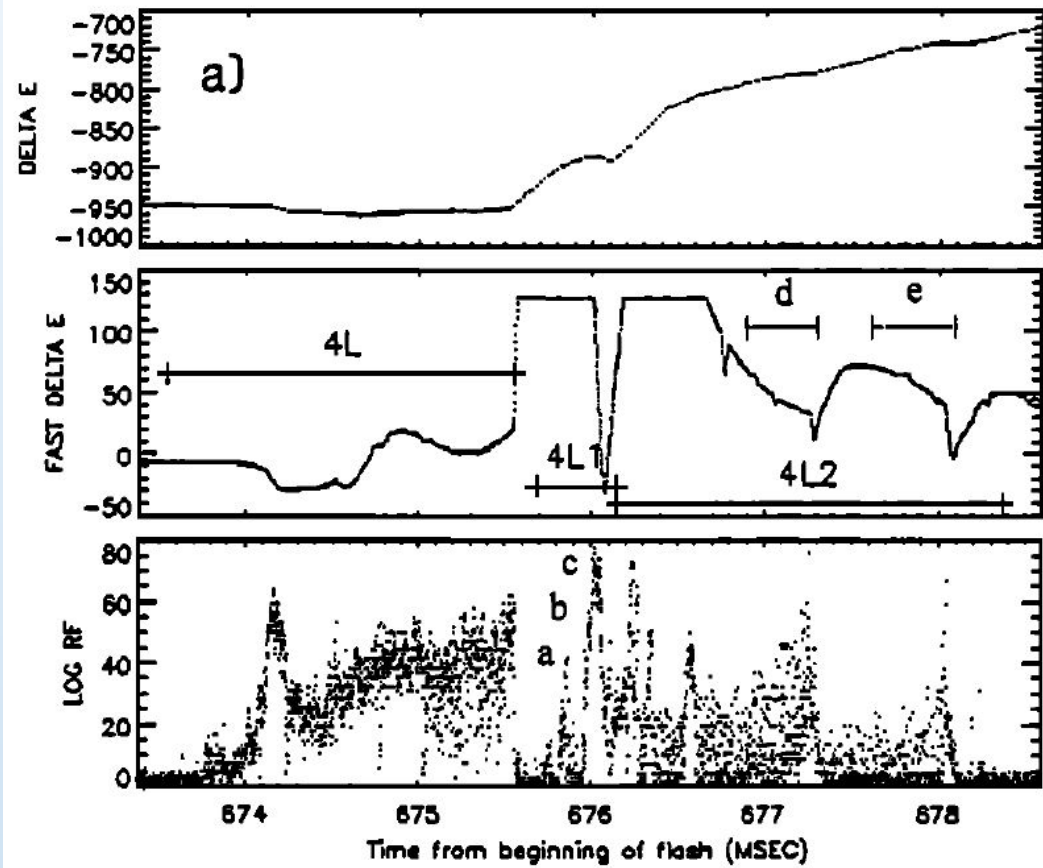
# Fourth Ground Stroke



# Fourth Ground Stroke

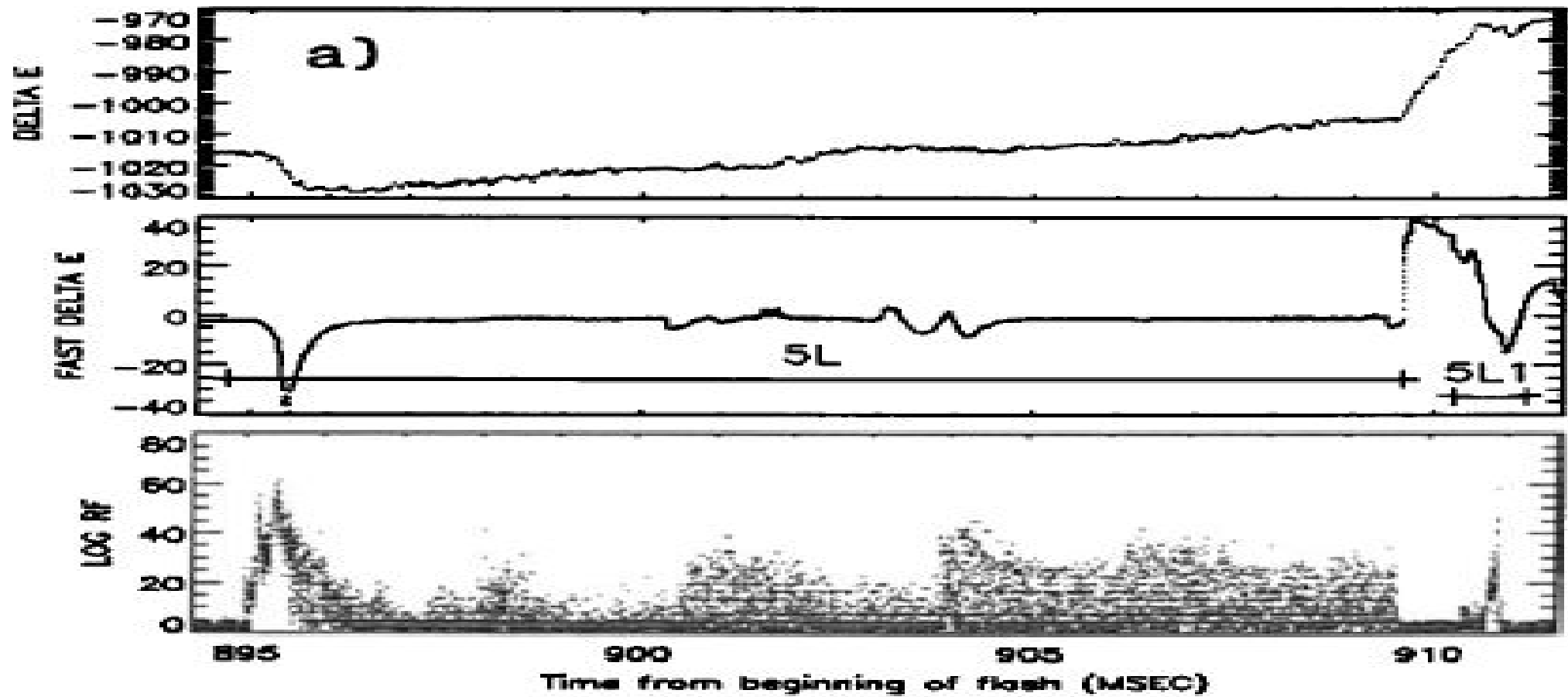


# Fourth Ground Stroke

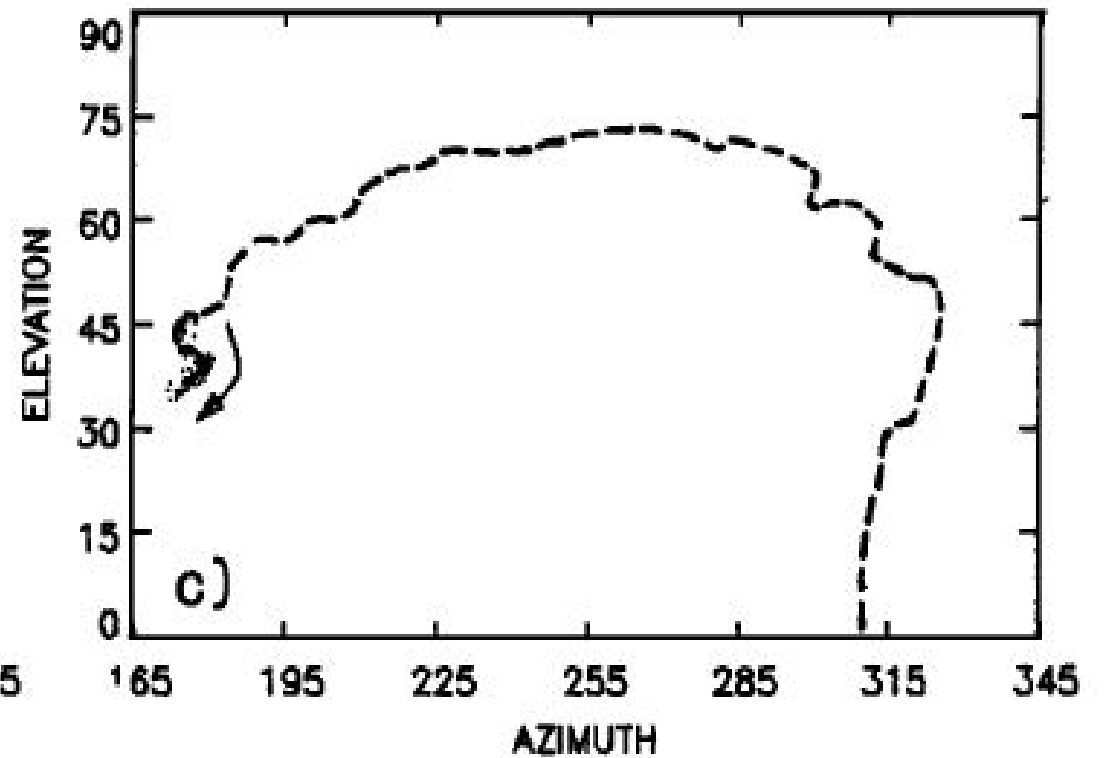
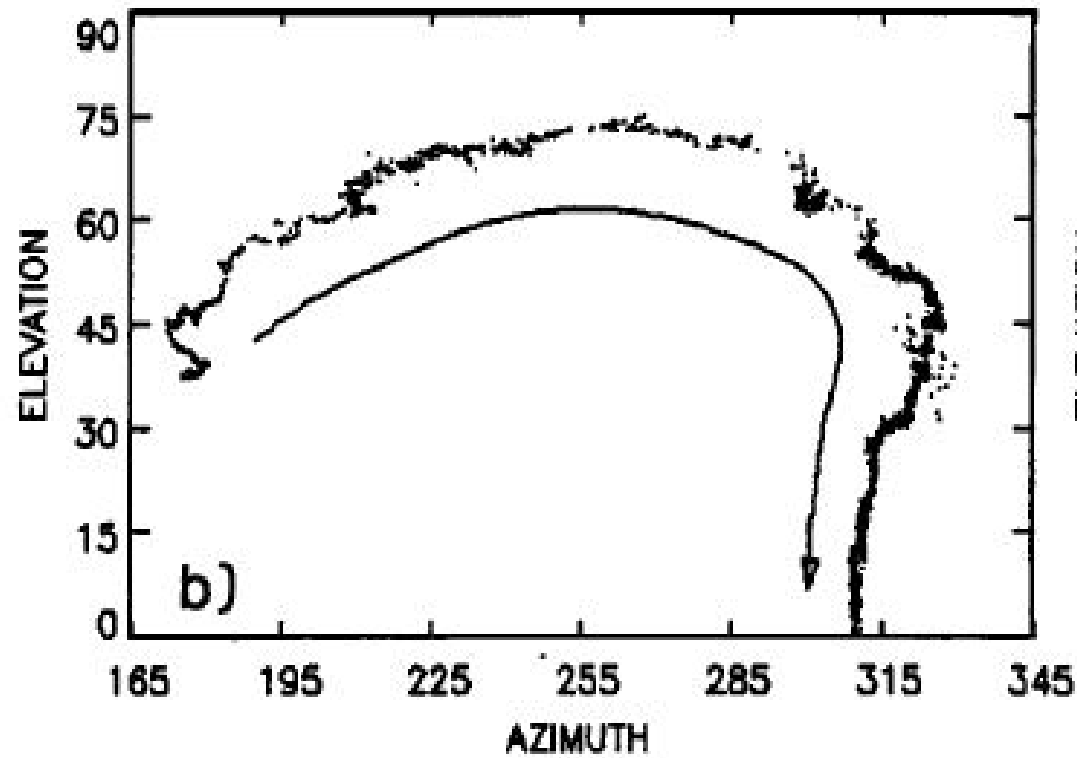




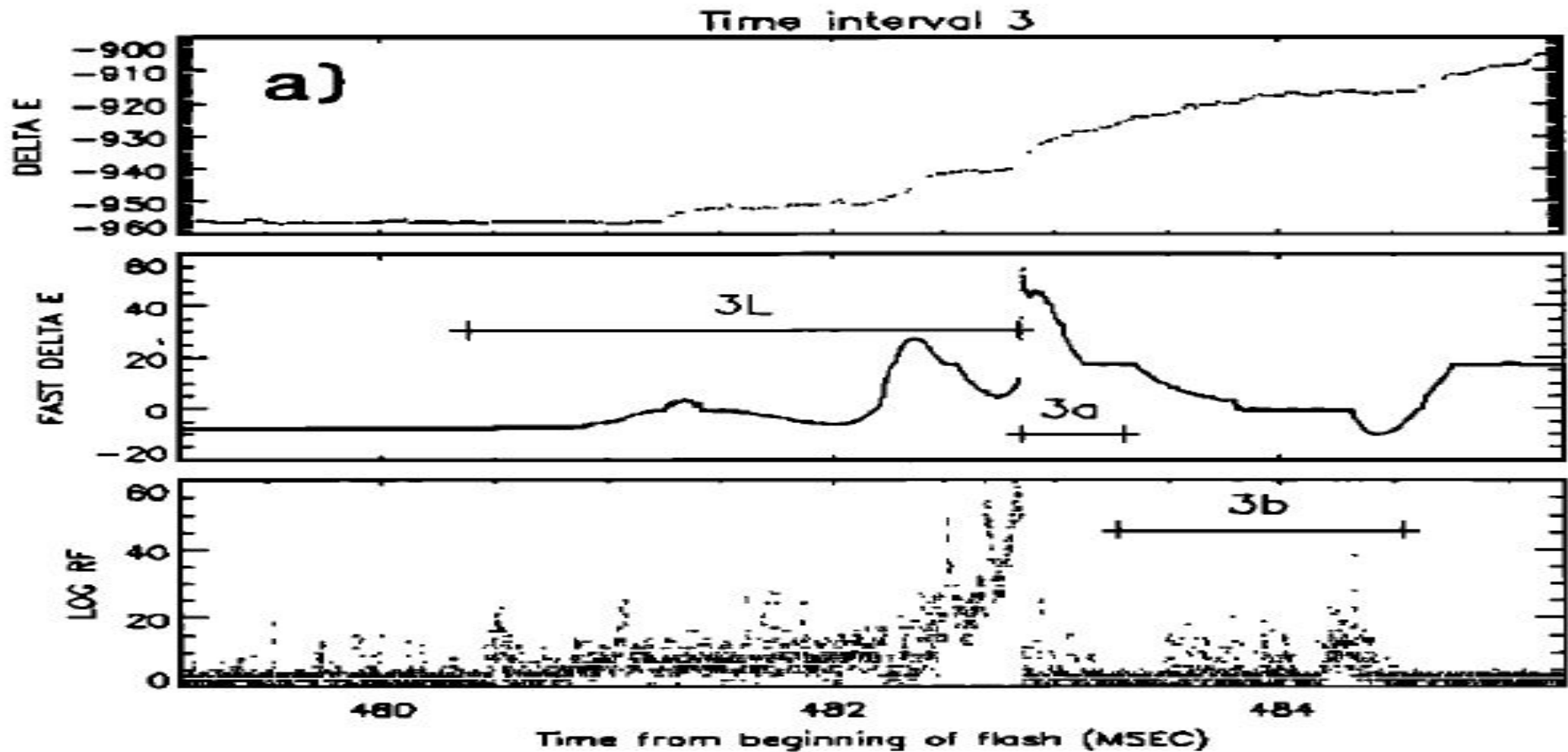
# Fifth Ground Stroke



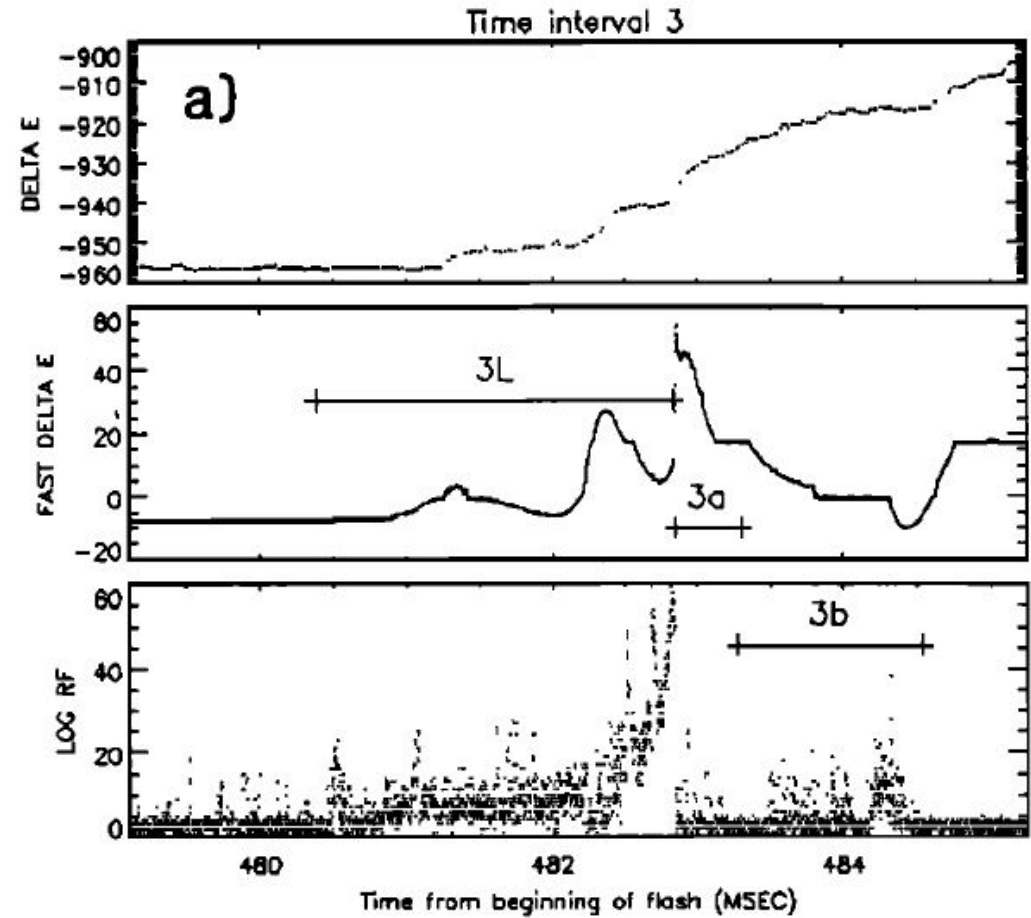
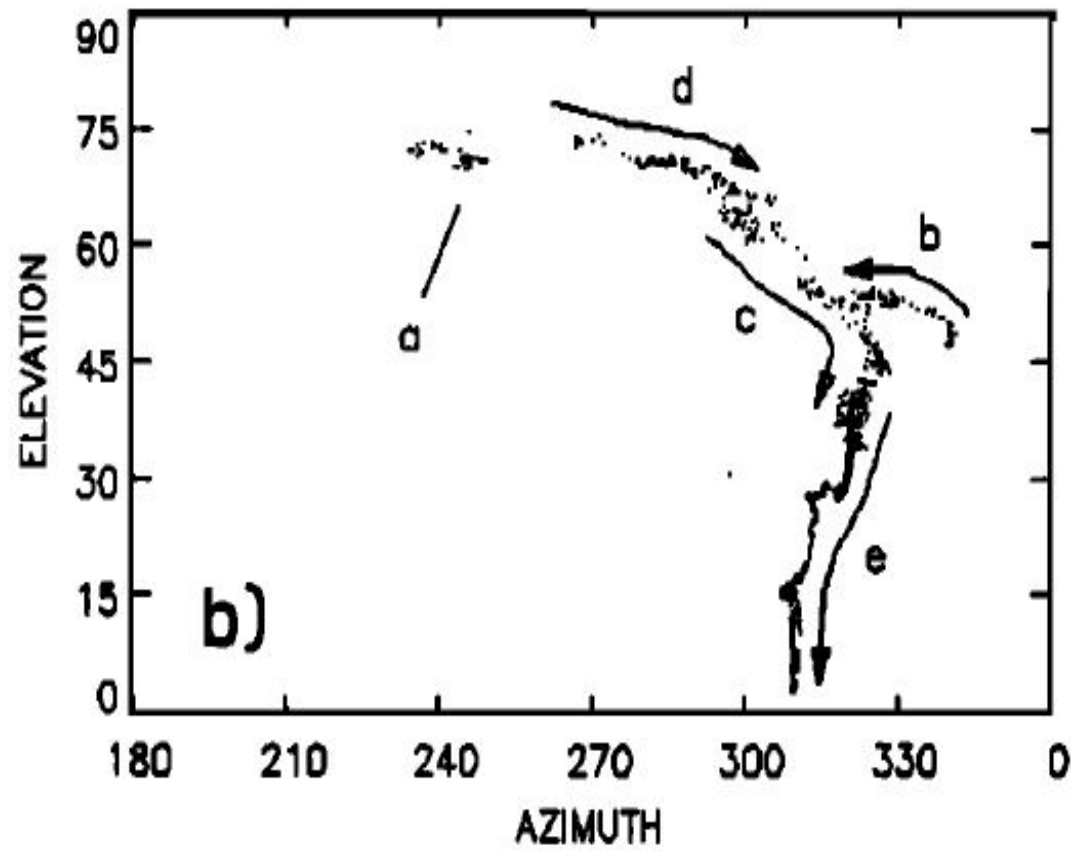
# Fifth Ground Stroke



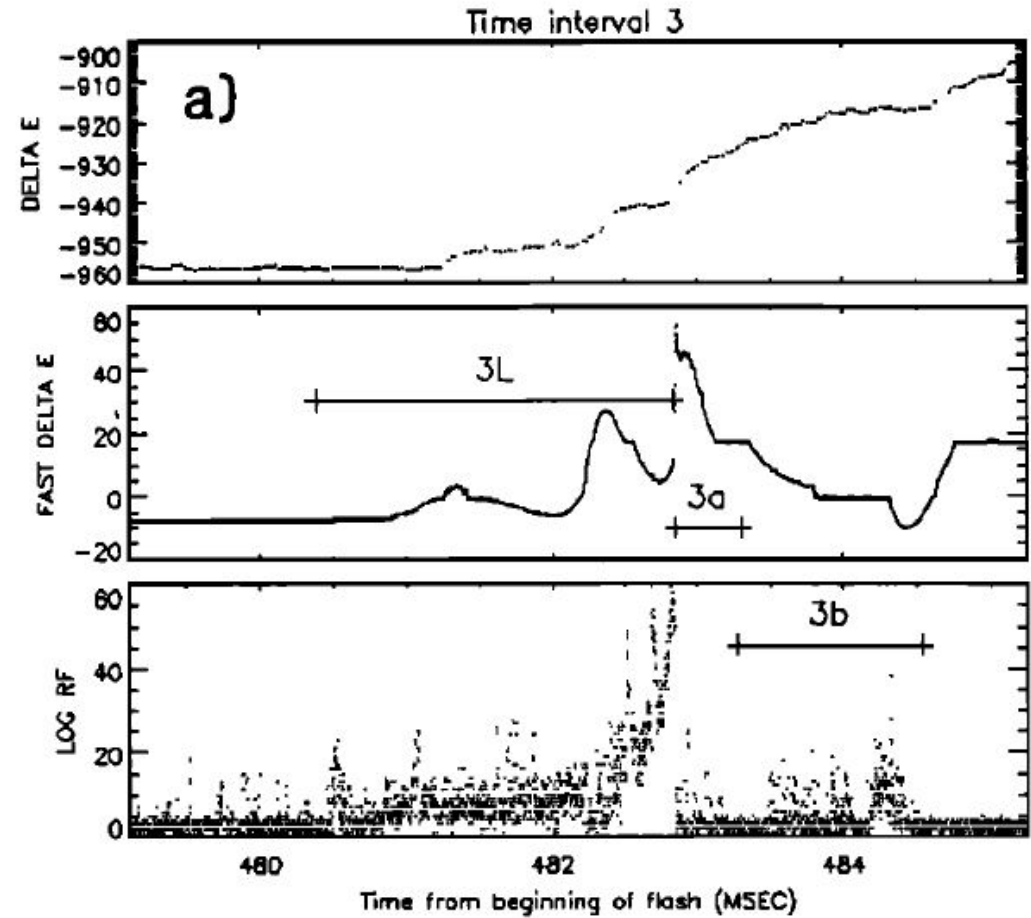
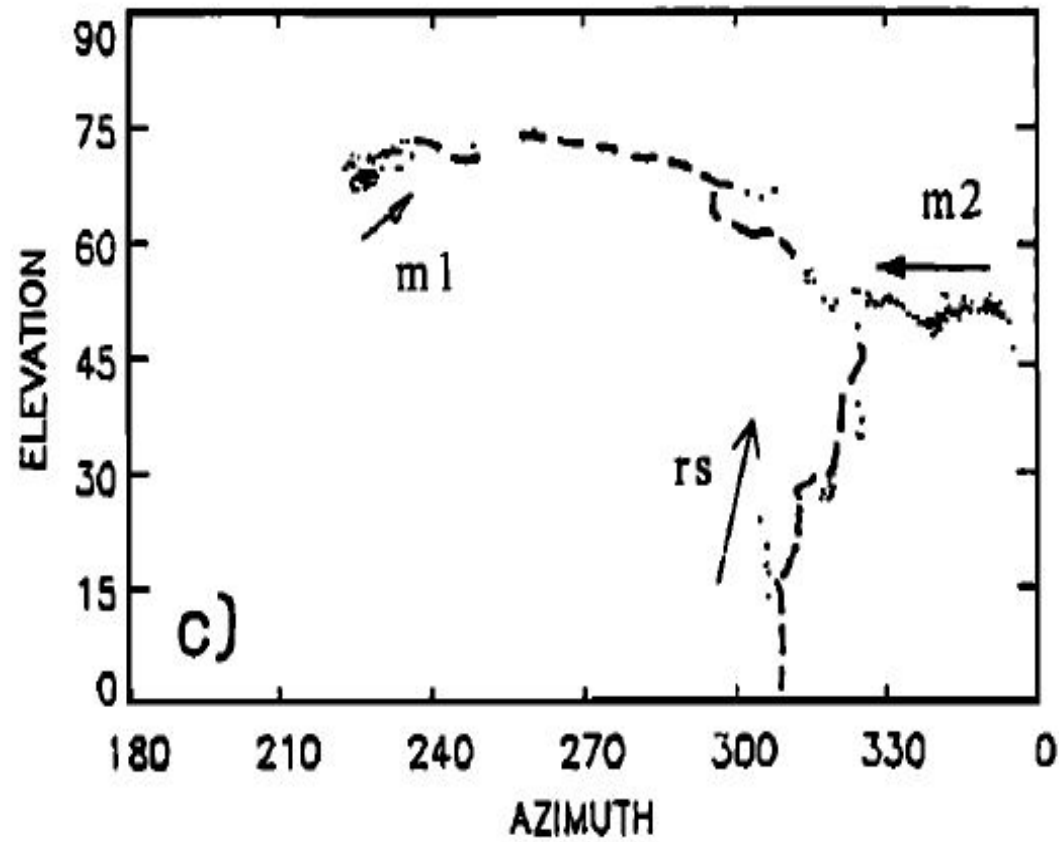
# Third Ground Stroke



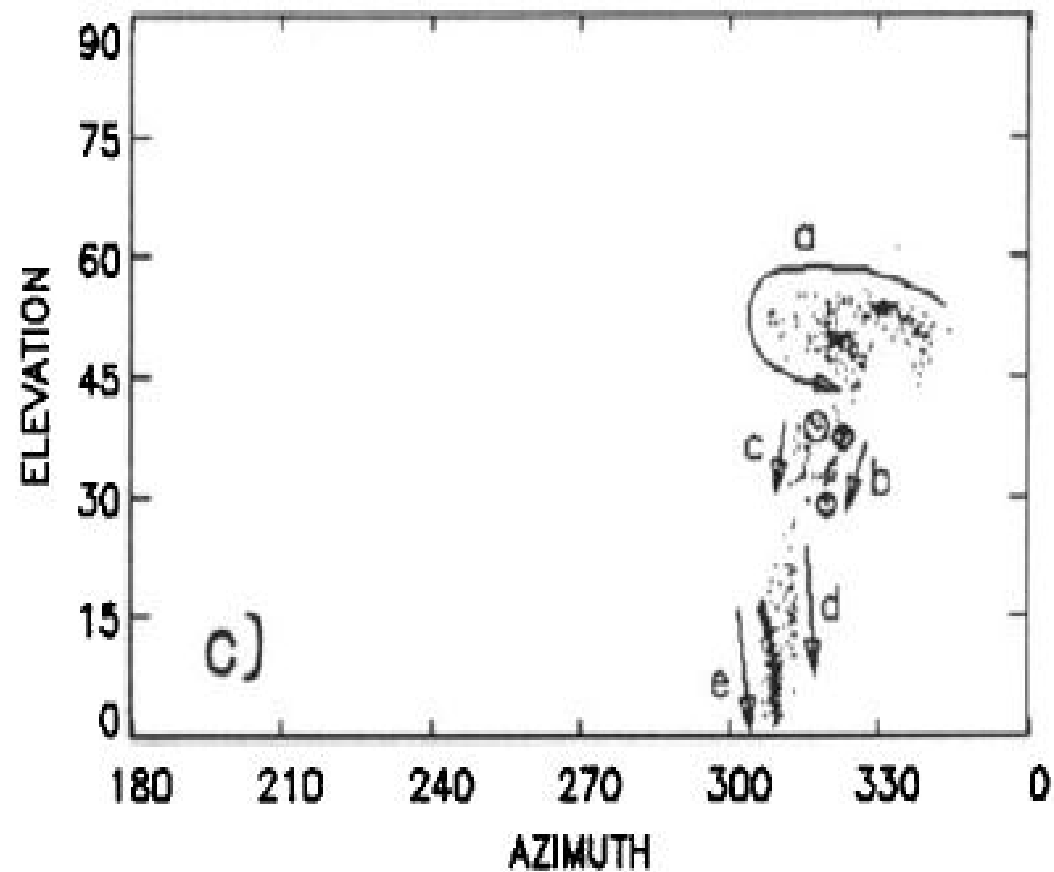
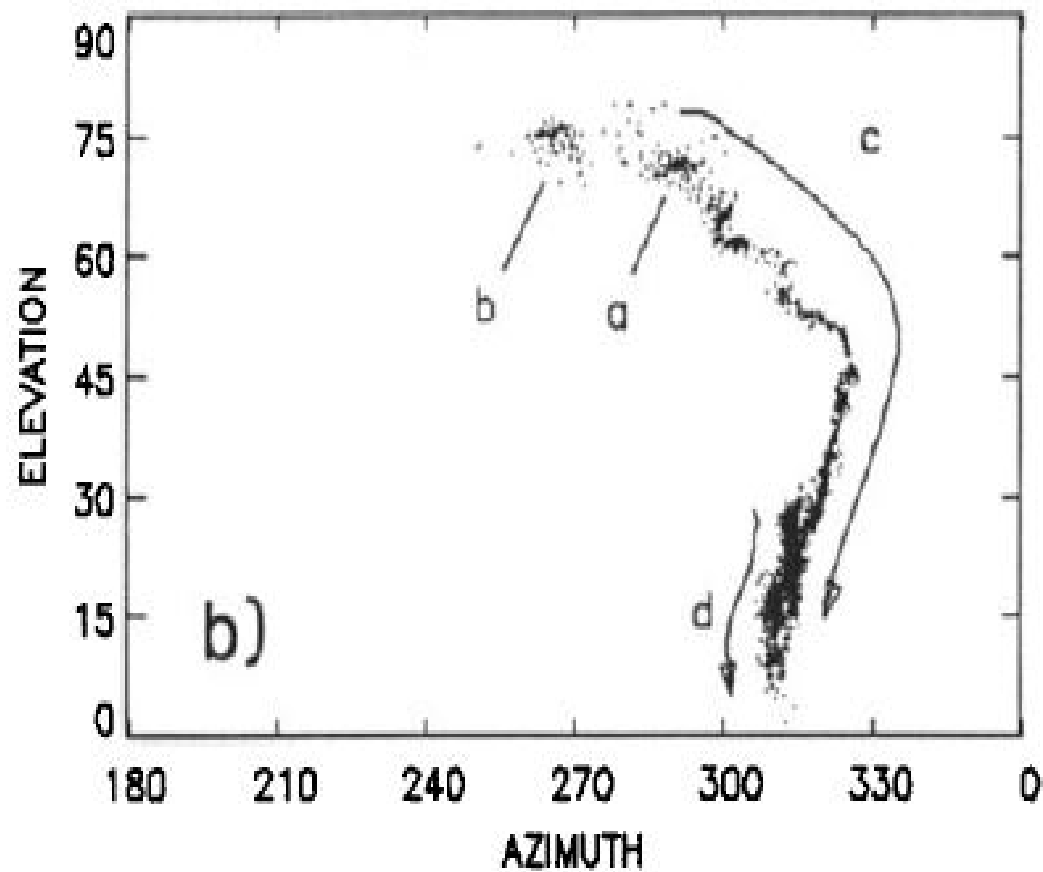
# Third Ground Stroke



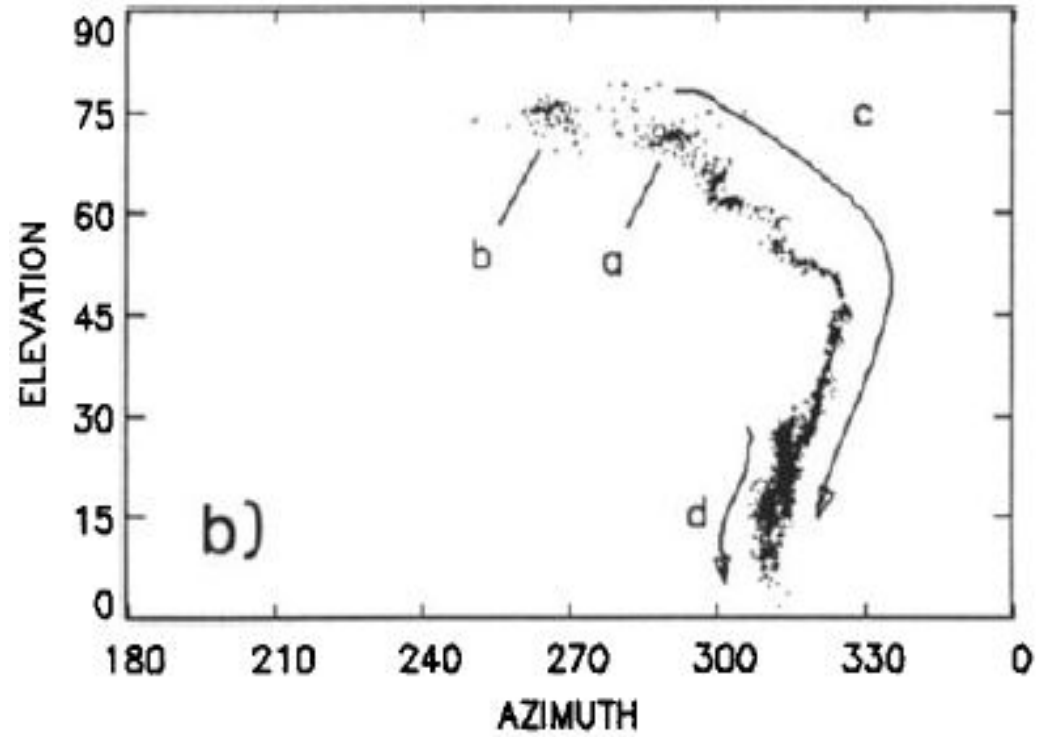
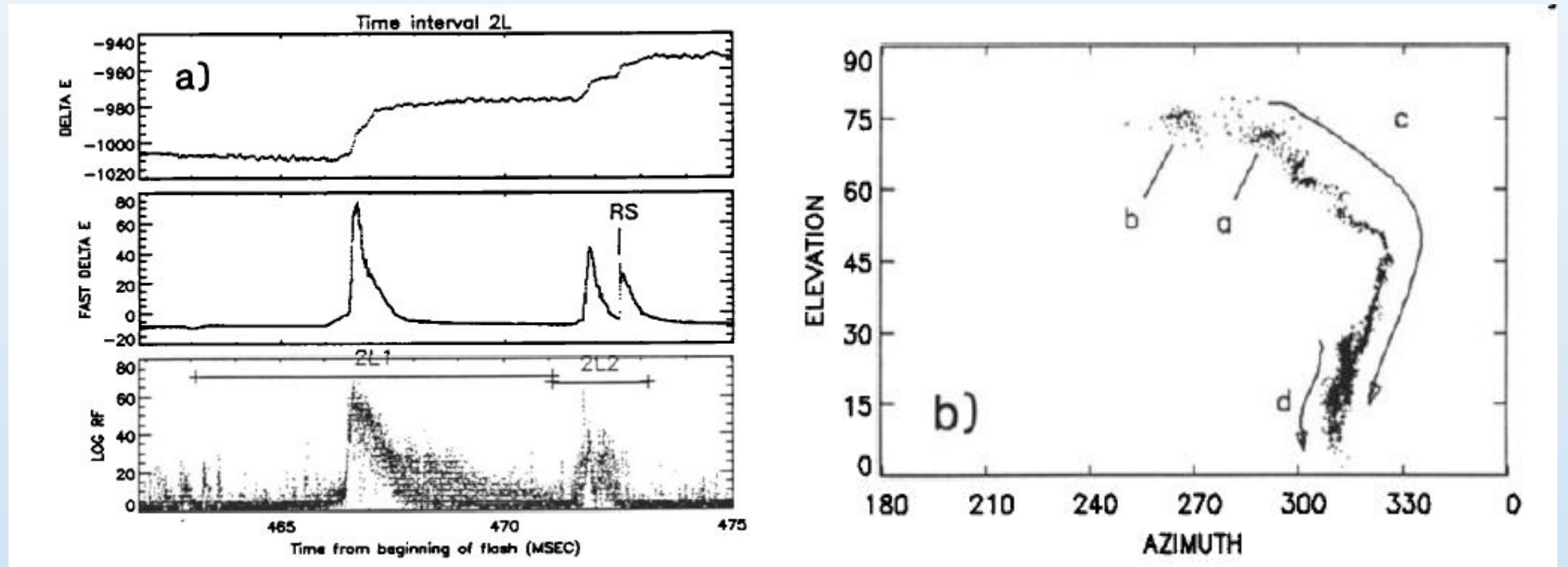
# Third Ground Stroke



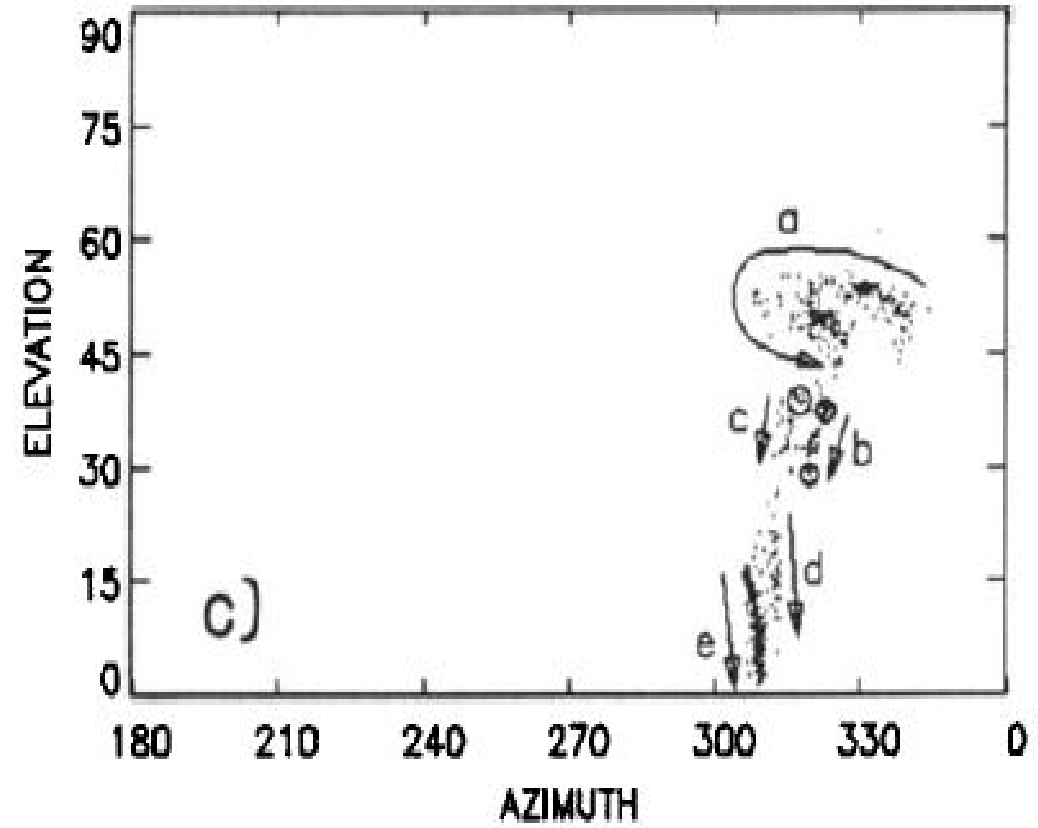
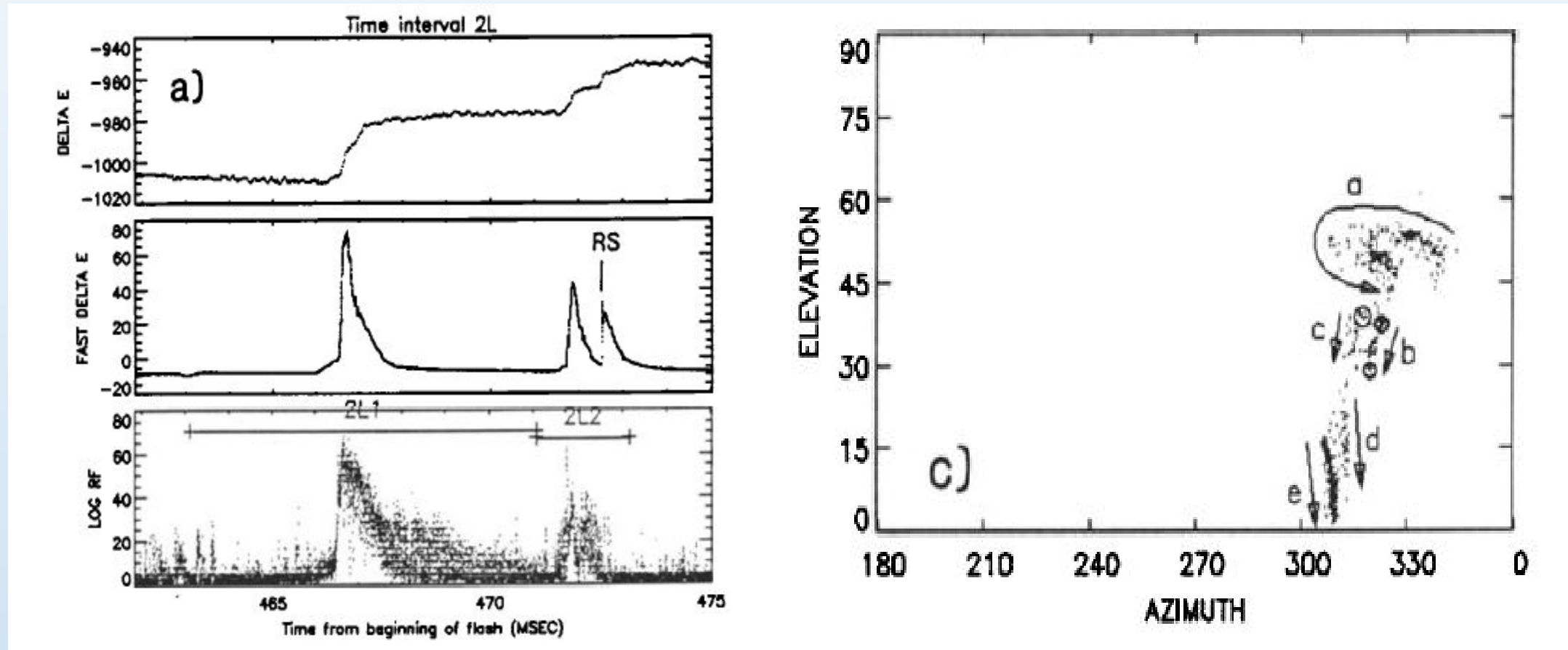
# Failed Leader and Second Ground Stroke



# Failed Dart Leader

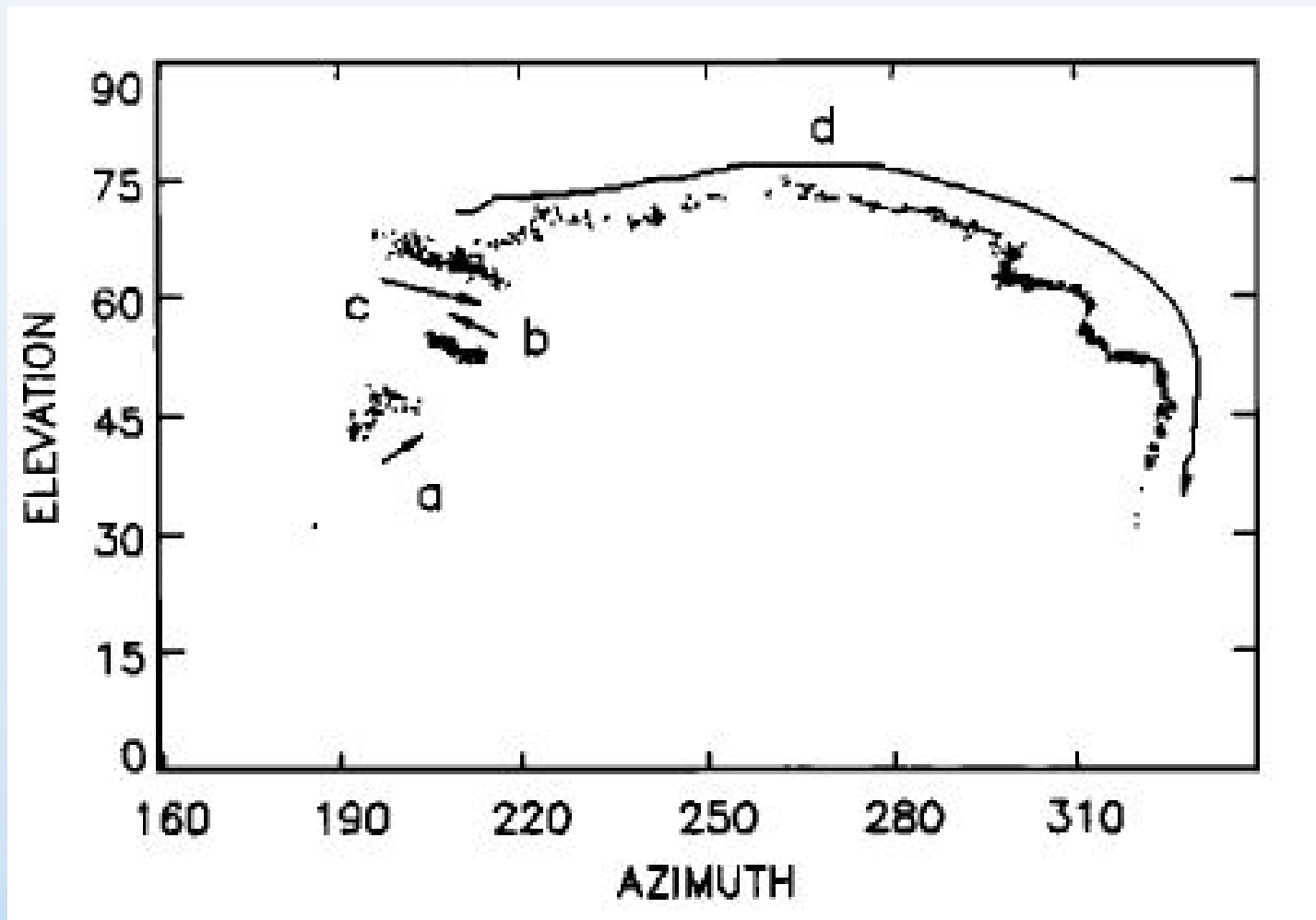


# Second Ground Stroke

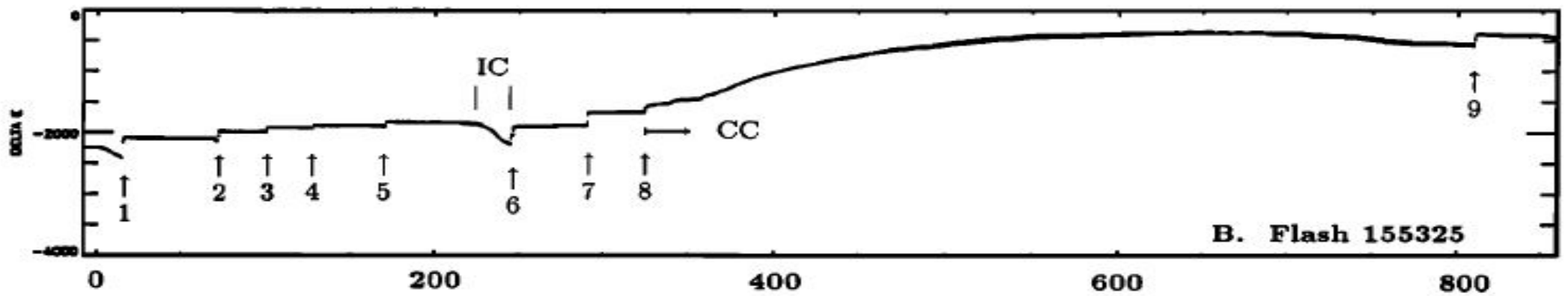
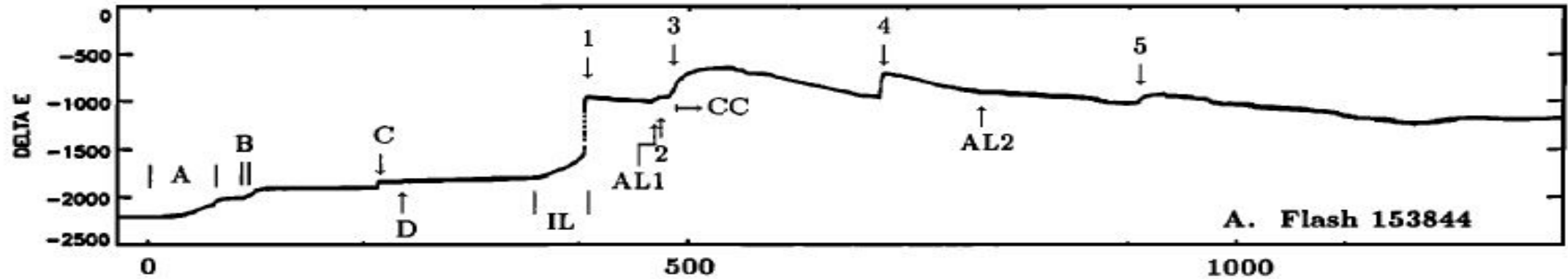




# Second Failed Leader



# Electric Field Changes



Time from Beginning of Flash. ms

# Conclusions

- Interferometry is good at seeing the location of radiation caused by breakdown
- These breakdown events are caused by fast streamers and intense local breakdown
- Dart leaders and K type events are only differentiated by Dart leaders going to ground
- Fast moving negative streamers move towards the leader and help to feed it negative charge