ALASKA INTERIOR THUNDERSTORMS

Hugh D. Watson (1)
4632 S. Oak
Wichita, Kansas 67217

1. OBJECTIVE

This is a short, simple, essentially non-technical presentation of data concerning thunderstorms in the Alaska interior.

2. RADAR

The radars used for storm detection were 23-cm ARTC radars, supplemented by one or two 5-cm WR100 Weather radars. The ARTC radars have been much maligned over the years, but did an excellent job. In 1965 the National Severe Storms Laboratory (NSSL) compared the return of the 23-cm ARTC radar with the return of the 10-cm WSR-57, and found that for ARTC radars operating with the STC and MTI (Sensitivity Time Constant and Moving Target Indicator) off, and not in circular polarization, the difference was only 3 db at 200 miles. Apparently, the ARTC radar's greater peak power, nearly 10 times that of the WSR-57, almost compensates for the difference in wavelength. The bad feature of the ARTC radar is that the power cannot be selectively reduced to determine the intensity of precipitation. For a fuller discussion of ARTC radar, see (2).

3. THUNDERSTORMS

To place interior-Alaska thunderstorms in proper perspective, the scope pictures of two 23cm radars were composited, reduced, and placed on a briefing chart used at the Fairbanks office of the Bureau of Land Management (BLM). Figure 1 shows a partial representation of the radar scope picture. The area of showers and thunderstorms outlined on this chart covers about 100,000 square miles, an area larger than 35 of the 50 states. Summertime outbreaks of this magnitude are not particularly unusual. At this time, 1600 Alaskan Daylight Time (ADT), 0100Z 19 July 1980, the tropopause data was indefinite, but the glaciation stage, -28C, was at 25,000 feet. Within the total area (not shown in Figure 1) 48 cells had tops to at least 25,000 feet, 17 were between 30,000 and 35,000 feet, and two were above 35,000 feet. Tops in excess of 40,000 feet were noted at various times during the summer.

4. SEVERE WEATHER

Severe thunderstorms do occur in the interior of Alaska. Figures 2a through 2f show the evidence. Pilot reports of "snow" covered hilltops after the thunderstorms were more likely hail on the hilltops. While severe thunderstorms are not a rarity, tornado reports are. Mr. Ted Fathauer, then MIC of WSFO Fairbanks, wrote an excellent article on the Kiana tornado of August 1976 (3). The tornado at Kiana has been the most fully documented tornado known thus far. However, over the years, there have been numerous verified reports of funnel clouds and at least two waterspouts. It is estimated that Alaska has, on the average, one tornado a year. I suspect that this is an understatement. Due to the very sparse population in the areas most likely to have thunderstorms, and the lack of proper communications, a vast number of tornadoes could occur without being reported. Until such a time as properly

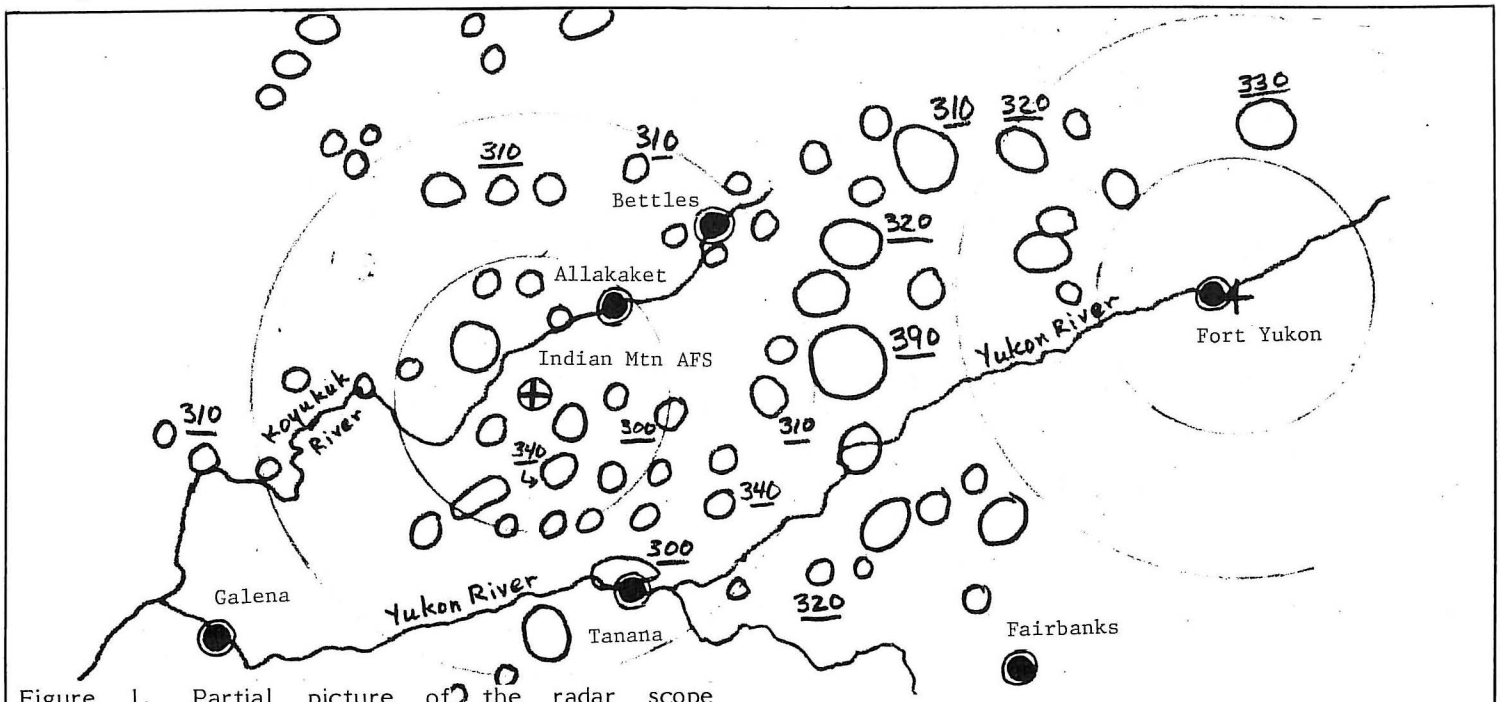

Figure 1. Partial picture of the radar scope representations of Indian Mountain AFS (PAIM) and Fort Yukon (FYU), July 19, 1980, 0100 GMT (1600LT). First circles are the 40nm range, and the second the 80nm range. Tops 30,000 feet and above in this partial picture are marked.

Figure 2.a Damage caused by severe thunderstorms at Fort Wainwright, AK on July 18, 1980. (Fort Wainwright is just east of Fairbanks, AK).

Figure 2.b (See Figure 2.a)

Figure 2.c (See Figure 2.a)

Figure 2.d (See Figure 2.a)

Figure 2.e (See Figure 2.a)

Figure 2.f (See Figure 2.a)

sophisticated long range weather radar is installed in the interior of Alaska, the true incidence of severe weather will remain unknown. Such an installation would also be of incalculable value to the flash flood and aviation programs of the Fairbanks WSFO.

5. STATISTICS

The data shown in Figures 3 a through e indicate that most of the thunderstorms occur north of 62 degrees N and the crest of the Brooks range (4). Figure 4 shows the locations of a number of reporting stations. The graphs were derived from a variety of sources, and some occurrences were inferred rather than observed. Continuously reporting weather stations were sparse, and mostly not in the areas of maximum thunderstorm activity, and their data was considered the least useful. As noted by Grice and Comiskey (4), there are limitations in using satellite data for locating thunderstorms in Alaska, not the least of which is that thunderstorms can dissipate between passes of the polar-orbiting satellites. Additionally, developing cumulonimbus can be obscured by the debris left by previous thunderstorms. They found, as I did, that most Alaska thunderstorms are of the air-mass type.

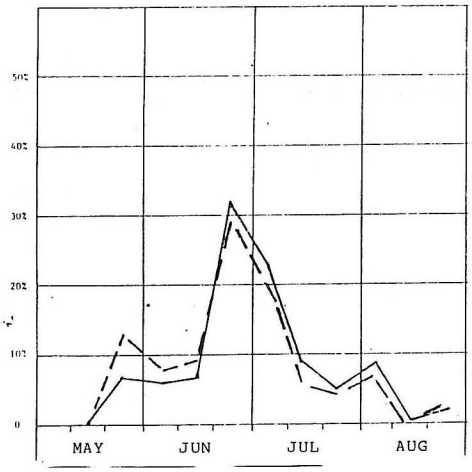

Figure 3.a Percentage Frequency of Thunderstorm Days for Kuskowim Mountains Sector (Solid Line) and neighboring stations: McGrath and Tatalina AFS (Broken Line).

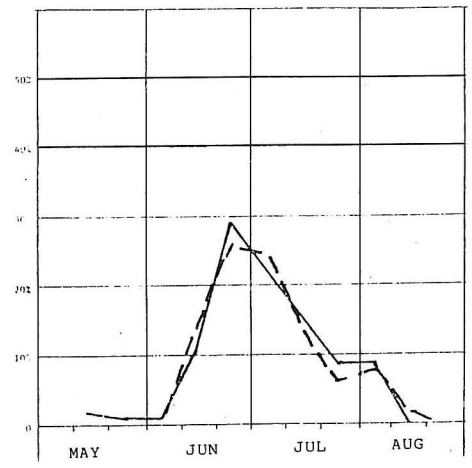

Figure 3.b Percentage Frequency of Thunderstorm Days for Galena Sector (Solid Line) and neighboring stations: Galena AFS, Indian Mountain AFS and Tanana (Broken Line).

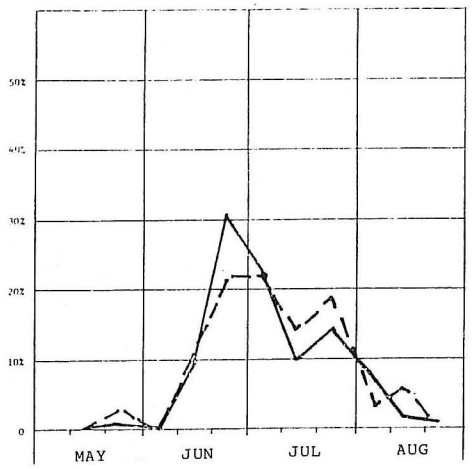

Figure 3.c Percentage Frequency of Thunderstorm Days for the Yukon-Tanana Upland Sector (Solid Line) and neighboring stations: Fairbanks, Eilson AFB, Big Delta, and Northway (Broken Line).

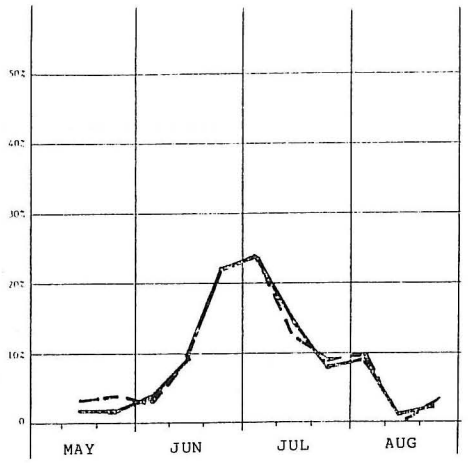

Figure 3.d Percentage Frequency of Thunderstorm Days for Brooks Range Sector (Solid Line) and nearby station, Bettles (Broken Line).

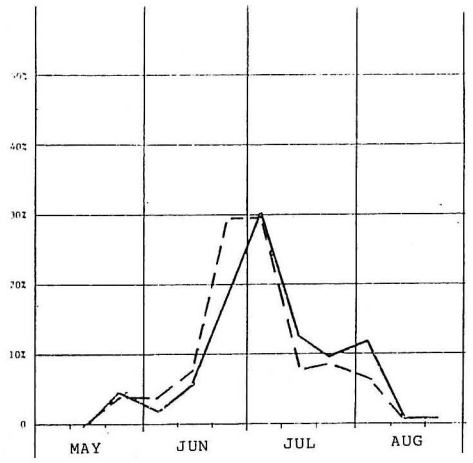

Figure 3.e Percentage Frequency of Thunderstorm Days for the Talkeetna Mountains Sector (Solid Line) and neighboring stations: Gulkana, Summit and Talkeetna (Broken Line).

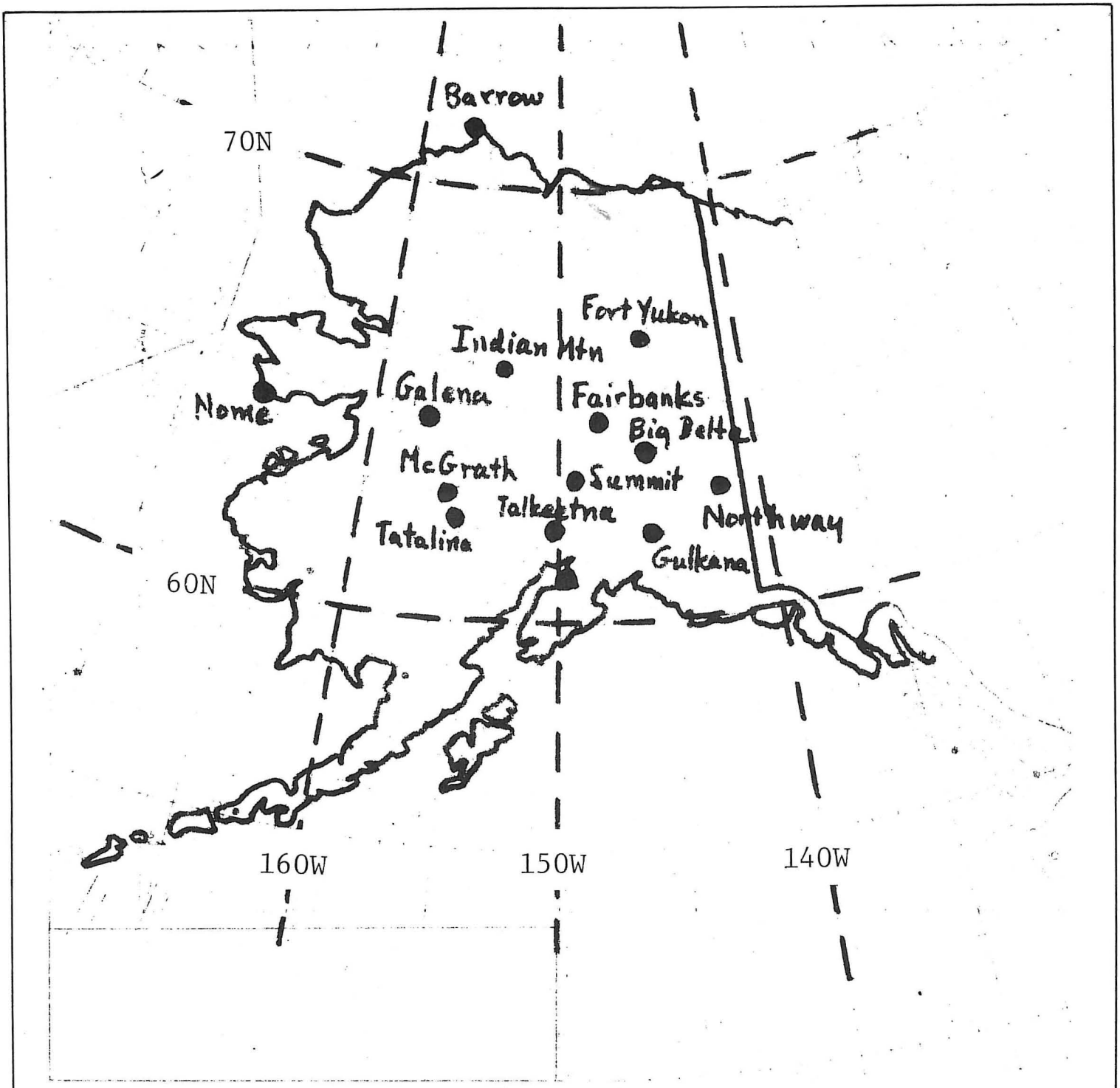

Figure 4. Location of some of the reporting stations shown in Figures 3 a through e. The remainder can be seen in Figure 1.

REFERENCES AND FOOTNOTES

1. Mr. Watson has been employed for the last two summers (1979-80) as project forecaster and briefer for fire weather by the Defense Division of the Brunswick Corporation, prime contractor for the Alaska Meteorological Services of the U.S. Bureau of Land Management (BLM). He was assigned to the Fairbanks District Office of the BLM.

2. Benner, H.P. and D.B. Smith; "Joint ESSA/FAA ARTC Radar Weather Surveillance Program". A comparison of the radar returns of the WSR-57 and ARTC Radar. United States Weather Bureau Technical Memo (WBTM) WR-35, Revised.

3. Fathauer, Ted; 1977. "Alaska Tornado". In depth report and analysis of the Kiana, Alaska tornado of August 1976; Weatherwise, American Meteorological Society, 30:3.

4. Grice and Comiskey; 1976. "Thunderstorm Climatology of Alaska." A climatological study of thunderstorms during the years 1969 through 1974, incl.; NOAA Technical Memo, National Weather Service AR-14.