

**A PAUCITY OF NOCTILUCENT CLOUDS OVER NORTH AMERICA IN THE 1950s?** M.S. Zalcik<sup>1</sup>, F.C. Loehde<sup>2</sup>, J. Brausch<sup>3</sup>, A.A. Mardon<sup>4</sup>, <sup>1</sup> NLC CAN AM, #7-14130 80 Street, Edmonton, AB, T5C 1L6, [bigg\\_skymerchant@hotmail.com](mailto:bigg_skymerchant@hotmail.com), <sup>2</sup> 10312 Willingham Road, Huntersville, NC, 28078, [franklinloehde@mac.com](mailto:franklinloehde@mac.com), <sup>3</sup> 208 South G Street, Glen Ullin, ND, 58631, [jbrausch@westriv.com](mailto:jbrausch@westriv.com), <sup>4</sup> Antarctic Institute, of Canada, #103 – 11919 82 Street, Edmonton, AB, T5B 2W4, [amardon@yahoo.ca](mailto:amardon@yahoo.ca).

**Introduction:** The beautiful summertime twilight phenomenon of noctilucent clouds (NLC) has been seen globally only since 1885 [1]. In North America, it took another 48 years before NLC were first seen, by Vestine in 1933 [2]. Thereafter, there was another lengthy gap with no NLC, 23 years; in 1956 Kiniski [3] recorded a quartet of consecutive active nights in late June. Only thereafter were NLC seen in North America on a more frequent basis, though only once or twice a year for the rest of the 1950s, with the total number of documented sightings from 1956-1959 being nine [4]. The paucity of NLC was not apparent elsewhere in the world. In the Soviet Union, an earnest observing program took place throughout the decade from 201 stations [5], with the active-night total in 1950-59 being 126. Paton [6], based in Abernethy, Perthshire, Scotland (56.3N 03.4W), tallied fifteen active nights in total from 1950-1958, with at least one active night per year. Comparisons with the North American observations are presented in Table 1. The high average of sightings in the Soviet Union can be explained by the sheer number of observing sites. Zalcik et. al [7] noted that from North American observations, an increase in observer numbers intrinsically translates to an increase in sightings due to the improved geographic coverage.

Table 1. Active-NLC nights in the 1950s in Three Areas

Area	Years	Sites	Active-NLC Nights	Avg/Yr
N. America	1953-59	6	9	1
Soviet Union	1950-59	201	126	13
Scotland	1950-58	1	15	2

Unlike in the Soviet Union and Scotland, a dedicated NLC surveillance program was not in place in Canada nor the United States at the time; hence, it is problematic to compare the North American data with the other data sets. However, an enthusiastic aurora monitoring program was underway through much of the decade and into the 1960s, this initiative based in Edmonton, Alberta [8]. One of us (FL) was an active participant in the effort. Edmonton (54.5N 113.5W) is within the prime observing zone for NLC, and in the months of June and July, Edmonton experiences perpetual twilight, opening up the possibility of seeing NLC all night in addition to aurorae. Observations by the NLC CAN AM surveillance network from 1988-2017 indicate that aurorae and NLC can be seen during the same night, often simultaneously, an average of eight times each season.

Yet the Milton auroral sky checks revealed no documented coincident observations of NLC throughout the entire study period. For example, there were no reports of NLC in Stardust, the newsletter of the Edmonton chapter of the Royal Astronomical Society of Canada. Two other program participants, Bruce Bohannon and Ian McLennan, recall spotting

one and “two or three” NLC displays, respectively; it is not known if any of these were the same displays seen by Kiniski in 1956. FL, as well as observers Richard Henry, Patrick Kehoe, and Bill Hruday, saw no NLC during the auroral study program.

Were NLC truly rare in North America at the time? A study of imagery from the Cloud Imaging and Particle Size (CIPS) instrument on the Aeronomy of Ice in the Mesosphere (AIM) satellite from 2007-2014 shows no asymmetry in the longitudinal distribution of polar mesospheric clouds in the northern hemisphere [9]; however, asymmetry does exist in the southern hemisphere due to nonmigrating semidiurnal tides. Perhaps in the 1950s and beforehand conditions also existed that led to NLC being much less frequent at North American longitudes. Or perhaps northern hemisphere longitudinal NLC distribution was even in the 1950s as it is today, but the NLC were simply being overlooked by the Milton observers, who were keenly scanning the skies for aurorae, but *not* NLC. Or perhaps NLC *were seen, but not reported*. Yet it is difficult to believe that especially a bright, extensive display of NLC could go undocumented by a dedicated group of sky watchers. Zalcik et al. [10] and Zalcik et al. [11] pointed out that a number of factors come into play with regard to detecting a display of NLC. Experience with monitoring various phenomena of the sky certainly helps, as does an ideal observing location with an unobstructed horizon. One of us (JB), residing in Glen Ullin, ND (46.8N, 101.8W), began aurora observing in 1981. On Jun 30/Jul 1, 1993, a display of NLC was clearly occurring simultaneously with an aurora. Subsequent careful NLC monitoring has yielded *at least one display of NLC each year since*, a full quarter-century of NLC incidence despite the low-latitude observing location.

**References:** [1] Bronshten, V.A. and Grishin, N.I. (1976) Noctilucent Clouds, Keter House, Jerusalem. [2] Vestine, E.H., (1934), Noctilucent Clouds, JRASC, 28, 249. [3] Kiniski, J.J. (1957) Weather, Vol. 12, 258. [4] Fogle, B. (1966), Noctilucent Clouds, University of Alaska UAG R-177. [5] Bronshten and Grishin, Ibid. [6] Paton, J. (1961) in: Annals of the International Geophysical Year, Pergamon Press, Oxford, Vol. XI, p.4. [7] Zalcik, M.S. Noble, M.P., Dalin, P., Robinson, M., Boyer, D., Dzik, Z., Heyhurst, M., Kunnunpuram, J.G., Mayo, K., Toering, G., Toering, M., Wooden, K., Cruesot, N., Hengen, B., McVey, S., Packham, C., Prokop, G., Wilson, L., Connors, M., Schofield, I. (2014), JRASC, 108, 4 (767), 148-155. [8] Milton, E.R. (1969), JRASC, 63 (5), 238-250. [9] Liu, X., Yue, J., Xu, J., Yuan, W., Russell III, J.M., Hervig, M.E., Nakamura, T. (2016) JGR Atmospheres, July 2016, DOI: 10.1002/2015JD024624, 1-20. [10] Zalcik, M. et al. 2014, Ibid. [11] Zalcik, M.S., Lohvinenko, T.W., Dalin, P., Denig, W., 2016, JRASC, 110, 61 (776), 8-15.