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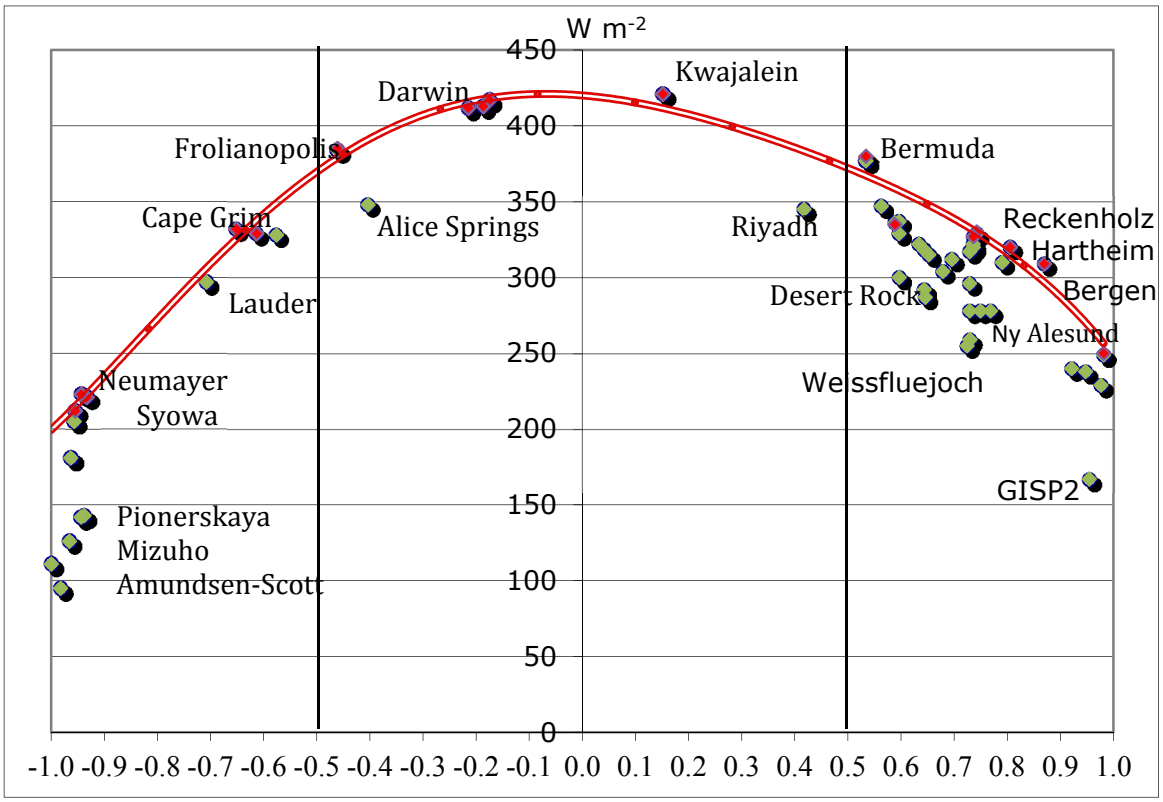

Figure 1: Observed annual mean terrestrial incoming irradiance in W m^{-2}. Sites near the sea level are marked red. Interior and high altitude sites are in green. Abscissa is sine of latitude, with 30° N and S marked with vertical lines indicating 50% of the earth's area. Main stations are highlighted with names. The red curve is the 4th-order polynomial fitted to the values observed at the near-sea level stations, approximating the global mean irradiance.

1) The development of the energy balance climatology is traced back to the origin of this branch of science in thermodynamics and radiation of the 19th century.
2) The paper follows development with respect to theory, observational capability and computational skill.
3) The most frequent problem hampering progress in this field has been the failure to utilize the observed fluxes. This problem continues to present, as for example witnessed in varying interpretations of the global mean energy balance even in the recent literatures.
4) A persistent problem is the underestimation of absorbance due to water vapour, both in the solar and terrestrial wavelength ranges, which results in an overestimation of the solar irradiance and an underestimation of the terrestrial atmospheric irradiance at the earth's surface.
5) For example, the estimate of the global mean terrestrial incoming irradiance at the earth's surface is close to 350 W m^{-2}, and increasing at a rate of 2.5 W m^{-2}/decade as a result of the increasing greenhouse gas concentration in the atmosphere.
6) In a decadal time scale the surface fluxes can change in an order of 5 W m^{-2}. These and the resulting problems need to be solved in the future.