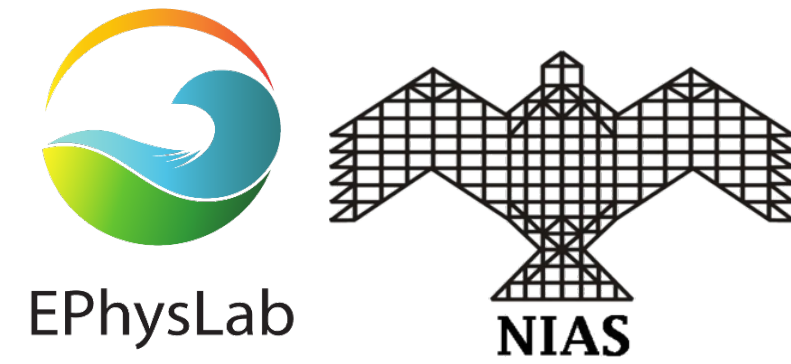


A rocketsonde database for middle and upper atmosphere research

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INTRODUCTION

Rocketsondes have been a source of measurements for the middle and upper atmosphere for years. They were launched for very different purposes, without regular programmes providing homogeneous spatial or temporal coverage, and the data they measured are not easily available. The middle stratosphere-cooling trend was verified from them almost thirty years ago (Dunkerton et al., 1998), and for the period before the satellite era they remain the only source of direct measurements at these altitudes.

The dataset kept by APARC since more than two decades ago encompasses 48 launching sites, concentrated in the USA and the Pacific islands, and almost all of it was collected before 1990. The WOUDC and RDA-NCAR archives hold a few soundings more. All these subsets suffer limitations, some so simple as the lack of precise coordinates for the launching sites, and they exclude a large fraction of the launchings carried out in Russia, India, China and Europe.

Here we report on a consolidated database. **Version 01 contains 32,786 individual temperature profiles from 43 stations, spanning 1960–2025**, merged from five archives, screened, de-duplicated and reformatted into a single documented product.

Data & Methods

Data have been recovered from the **APARC Rocketsonde Database**, the **ROCOZ-WOUDC** and **RDA-NCAR** databases, the **NCEI-NOAA** reports (Data Set 5850, land and mobile stations), the **NTRS-NASA** reports, the **SOLVE II** NASA campaign, and individual campaigns.

Each source was recovered in its native format, including the two 1976 NCDC tape manuals needed to decode Data Set 5850. Records with no temperature data were removed and levels without altitude or temperature discarded. Soundings coincident in site, date and time were compared and the deeper profile retained. Coordinates, WMO identifiers and station names were checked across sources, mobile stations resolved against the WOUDC station list, and every sounding rewritten as one plain-text file with a single missing-data convention and a self-describing filename.

An improvement over the existing datasets

	APARC / SPARC dataset	This database, Version 01
Scope	One archive reproduced as found	Five archives merged and reconciled
Content	36,592 records, ~8,600 with no temperature	32,786 curated temperature profiles
Duplicates	Not addressed	257 coincidences resolved, deeper profile kept
Metadata	Single identifier, gaps in position	Up to three WMO-IDs reconciled per station, ship codes recovered
Missing data	Five coexisting conventions	One convention, documented
Quality control	None beyond obvious errors	Documented screening, pending corrections identified

Several stations were reported under up to three different WMO identifiers across archives. They have been reconciled under a common identifier.

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Results

Table 1. Temperature observations from rocketsondes in Version 01 of the dataset. The five sources used so far are listed, with their relative contribution to the collected dataset.

Data source	Screened	In V01	Notes
APARC	36,592	30,465	48 launch locations, incl. one ship
NOAA-Sites	24,135	1,851	29 land stations, large overlap with APARC
NOAA-Mobile	318	285	ship-borne launches
ROCOZ (WOUDC)	175	171	ozone soundings, 11 stations + 1 ship
SOLVE II (NASA ESPO)	14	14	Arctic winter 2003 campaign
Total	61,234	32,786	temperature profiles

8,616 records were screened out for carrying no temperature data, and 257 date-and-time coincidences resolved in favour of the deeper profile.

Figure 1. Launching sites with soundings considered to build the Version 01. Coverage reflects the geography of the Cold War test ranges: dense over the USA, the Pacific and the polar ranges, thin elsewhere.



Missing records and contributions

We have identified a large body of rocketsonde measurements from previous published papers in countries like India, Russia, and France, launched for many different purposes. However, due to different reasons we have not been able to get access to the data: bureaucratic problems, missing records, etc.

We intend this to be a live dataset. If you have or could have access to rocketsonde data, or facilitate accessing them, please, contact us. We welcome collaborations in this ongoing work.

Discussion and next steps

These observations provide an independent reference for middle and upper atmospheric resaeorch, for the validation of reanalyses, and contributions to the APARC Reanalyses Intercomparison Project (A-RIP), and a pre-2002 anchor for the satellite records. Some work is pending:

- **Not yet corrected:** temperatures before the early 1970s, following Dunkerton et al. (1998). Version 01 flags this.
- **Not yet included:** winds, which exist in Data Set 5850, and potentially in many others.
- **Publication:** the dataset is being submitted to PANGAEA and a paper with the current version is under preparation.

If you have rocketsonde data, know where to find them or want to join our effort, let us know!

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