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The second release of the Toruń catalogue of Galactic post-AGB objects.

Morphological and spectral classifications

R. Szczerba[1], N. Siódmiak[1], G. Stasińska[2], J. Borkowski[1], P. García-Lario[3], O. Suárez[4,5], M. Hajduk[1], and D.A. García-Hernández[6]

[1] N. Copernicus Astronomical Center, Rabiańska 8, 87-100 Toruń, Poland
[2] LUTH, Observatoire de Paris, CNRS, Université Paris Diderot; Place Jules Janssen 92190 Meudon, France
[3] Herschel Science Center, European Space Astronomy Centre, Villafranca del Castillo, 28080 Madrid, Spain
[4] UMR 6525 H.Fizeau, Univ. Nice Sophia Antipolis, CNRS, OCA. Parc Valrose, F-06108 Nice cedex 02, France
[5] Instituto de Astrofísica de Andalucía, CSIC, Apartado 3004, E-18080 Granada, Spain
[6] Instituto de Astrofísica de Canarias, C/Vía Láctea s/n, 38200 La Laguna, Spain

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ABSTRACT

Context. The Toruń catalogue of Galactic post-AGB and related objects was created to facilitate the research on the late evolution of intermediate-mass stars and also to help in the identification of new post-AGB objects among AKARI sources.
Aims. The main reason for this upgrade of the catalogue was the necessity to open entries for *possible* post-AGB objects. As we have checked, most of them have double-peaked spectral energy distribution, which indicates that the circumstellar shell is detached and which is believed to be typical for post-AGB phase.
Methods. We have searched the literature available on the NASA ADS to find new or missed post-AGB objects and analyzed available data provided by Vizier for the new post-AGB objects. We have also classified the spectral energy distributions of the post-AGB stars and their HST images. Optical spectra of 4 M-type sources have also been obtained to confirm their classification.
Results. The present version of the catalogue contains 391 *very likely*, 83 *possible* and 66 *unlikely* post-AGB objects. We have given on-line access to optical spectra for 124 *very likely* and *possible* objects, to all the available HST images of post-AGB objects (**about 100**), as well as to long-term photometric data for 12 carbon-rich post-AGB objects. The catalogue gives also access to optical and infrared photometry, optical and infrared spectra and spectral types, and links to finding charts and bibliography for 474 *very likely* and *possible* post-AGB objects. Using this catalogue, we have confirmed the existence of a strong correlation between morphology and location in the (J-K) vs. (K-[25]) two-color diagram We also suggest that many as yet unknown binaries could be found among objects of spectral classes O/I. Our catalogue contains several post-AGB objects with M-type spectral types. We argue that they could be low-mass post-AGB stars that experienced recently an exceptional episode of high mass loss rate and may be precursors of post-AGB objects with circumstellar arcs.

Key words. stars: AGB and post AGB stars — Stars: evolution — Catalogs

1. Introduction

The term post-AGB has been used in a variety of contexts and with a variety of meanings. Semantically, it refers to the evolutionary stage of low- and intermediate-mass stars that follows the asymptotic giant branch (AGB) – when hydrogen and helium burning takes places recurrently in shells surrounding a carbon-oxygen core. It therefore includes stars that cover an enormous range in stellar effective temperatures (from a few thousand K to one or two hundreds of thousands K) and gravities (from log g of about 0 to more than 7) and may include the white dwarf stage (e.g., Schönberner 1983; Villaver et al. 2003; Stasińska et al. 2008). A narrower definition of post-AGBs, the one used here as well as in the first release of the Toruń catalogue of post-AGB objects (Szczerba et al. 2007), restricts it to stars having left the AGB but still not hot enough to ionize the surrounding matter. Note that our definition does not imply that the next stage is that of a visible planetary nebula (PN), since stellar ejecta prior to this stage may have dispersed in the interstellar medium well before the remnant star is hot enough to ionize them.

Send offprint requests to: R. Szczerba,
e-mail: szczerba@ncac.torun.pl

The post-AGB phase, although short in comparison with other stages of the evolution of low- and intermediate-mass stars, is interesting in several aspects. First, it is a stage where stars are very luminous, typically a few 10^3 times the solar luminosity, making them potential standard candles to determine the distances of galaxies (Bond 1997). Second, it is during this stage that dramatic events occur, leading to a drastic reduction of the mass-loss rate and to changes in the geometry of the ejected envelopes, from mostly spherical on the AGB to aspherical in post-AGBs and PNe. The recently discovered dual dust-chemistry in some PNe (e.g., Waters et al. 1998a; Cohen et al. 2002; Perea-Calderón et al. 2009) is already seen in some post-AGB objects (e.g., Waters et al. 1998b; Szczerba et al. 2003; Matsuura et al. 2004; Cerrigone et al. 2009). Finally, the mechanism that triggers departure from the AGB is not fully understood. Stellar models that describe the evolution from the AGB to the planetary nebula stage are generally not able to describe this transition from first principles (e.g., Schönberner 1983; Vassiliadis & Wood 1994; Blöcker 1995; Weiss & Ferguson 2009).

To facilitate the research on the unsolved problems mentioned above, we have published *The Toruń catalogue of Galactic post-AGB and related objects* (Szczerba et al. 2007, hereafter Paper I). Prior to this, the information on *all* post-AGB objects was disseminated among the astronomical literature, and no systematic search of the properties of post-AGB objects was attempted. The published version of the catalogue contains 3 categories: *very likely*, *candidate* (now called *possible*) and *disqualified* (now called *unlikely*) post-AGB objects. As in Paper I, in many cases the distinction between *very likely* and *possible* is based on the number of references in the Astrophysics Data System (ADS) in favor of the classification of the object as post-AGB. The limit applied is arbitrarily set to 5 (except for RV Tau and R CrB stars which are counted now as *very likely* independent of the number of references). Obviously, such a distinction is not very satisfactory, both because of the increasing number of papers and because of a personal evaluation of the criteria. For example, we have now checked that many of the sources labelled *possible* post-AGBs actually show the characteristic double-peaked spectral energy distribution (SED) seen in classical post-AGB sources (e.g., Kwok 1993), where the optical peak is attributed to the star and the infrared peak to the detached dusty envelope. In addition, most of these *possible* sources with known spectral classification have luminosity class typical for supergiants, also a property of post-AGB objects. Therefore, a natural evolution of our catalogue was to provide on-line access to all the data collected both for *possible* post-AGB sources and for *very likely* ones (only the latter were fully described in the previous version of the catalogue).

This paper is organized as follows: Section 2 describes the changes and new implementations in the catalogue. Section 3 discusses several aspects of post-AGB objects that become tractable with the present update to our catalogue. In particular, it discusses the relation between morphology, spectral energy distribution and binarity, as well as the problem of post-AGB sources with M spectral type. Section 4 provides a brief summary. Finally, an extensive on-line appendix discusses a global changes in the catalogue and individual objects.

2. Modifications to the first edition of the catalogue

For the present update of the catalogue, the literature survey is (hopefully) complete until the end of 2009.

2.1. A few reclassifications

Some objects changed categories, generally becoming *very likely* post-AGBs (as a result of new mentions in the literature), or, on the contrary, becoming *unlikely*. The reasons for changes and appropriate references are presented in the on-line-only appendix.

2.2. New objects added

There are now 391 *very likely* post-AGBs in the catalogue (as compared to 326 for the first version). The number of *possible* post-AGBs dropped from 107 to 83, since the addition of new objects in this category did not counterbalance the number of "upgrades" to the *very likely* group. The details for individual objects (new and those with changed category) are given in the on-line appendix.

2.3. Optical spectra added

The optical spectra of *very likely* and *possible* post-AGBs from Pereira & Miranda (2007) (9) and Suárez et al. (2006) (115) were added to the catalogue. The spectral types derived by the above authors are indicated in a separate column of the tables (i.e. in addition to the spectra types gathered from the literature and already appearing in the first release of the catalogue).

2.4. Classification of the overall energy distribution

Spectral energy distribution classes were determined for *very likely* and *possible* post-AGBs of the catalogue, following the classification scheme of van der Veen et al. (1989). Class I sources have a flat spectrum between 4 and 25 μm and a steep falloff toward shorter wavelengths. We introduced a class O for objects with blue spectrum and no or very small infrared excess. Comparison between spectral energy distribution "typical" for class O and I objects is shown in Fig.1. Class II sources present a maximum around 25 μm and a gradual falloff to shorter wavelengths; Class III ones show a maximum around 25 μm and a steep falloff to shorter wavelengths, with a plateau between 1 and 4 μm; Class IV objects have two distinct maxima, one around 25 μm and the other between 1 and 2 μm (IVa) or below 1 μm (IVb). The attributed SED classes are shown in a separate column of our online catalogue. SED class was not assigned for sources for which photometry is available for a not sufficient range of wavelengths, e.g., only in optical or only in far-infrared range.

2.5. Morphology and morphological classification

Images obtained with the *Hubble Space Telescope* (HST) for *very likely* and *possible* post-AGBs appearing in our catalogue are accessible on-line. These include images from The Catalog of Hubble Images of Nascent and Infantile Planetary Nebulae by Balick, Huehnerhoff, and Baerny (http://www.astro.washington.edu/users/balick/pPNe/), images presented and discussed in Siódmiak et al. (2008) and in Ueta et al. (2000), as well as other images available in HST archive and reduced recently by us (**about 30** objects). All together there are **about 100** objects in our catalogue imaged with HST.

All the images have been classified according to the scheme of Ueta et al. (2000): SOLE (star-obvious low-level elongated) objects, showing a bright central star embedded in a faint, extended nebulosity, and DUPLEX (dust-prominent longitudinally extended) objects, showing a bipolar structure with a completely or partially obscured central star. Point-source objects are classified as stellar-like (Siódmiak et al. 2008).

2.6. Variability of carbon-rich post-AGB objects

A long-term (14 years) V and R photometric study become available recently (Hrivnak et al. 2010) for 12 carbon-rich post-AGB objects. All of them are 21 μm emission sources, a property seen only during post-AGB phase. These data are included into our catalogue and their variability range is seen as a ”bar” at V and R wavelengths. In five cases a measurement of magnitude for comparison star is missing and we cannot show a range of absolute variability. Therefore only arrows at V and R wavelengths at arbitrary flux level are shown. These data are expanded into time series light curves in windows which are linked to these ”bars” or arrows.

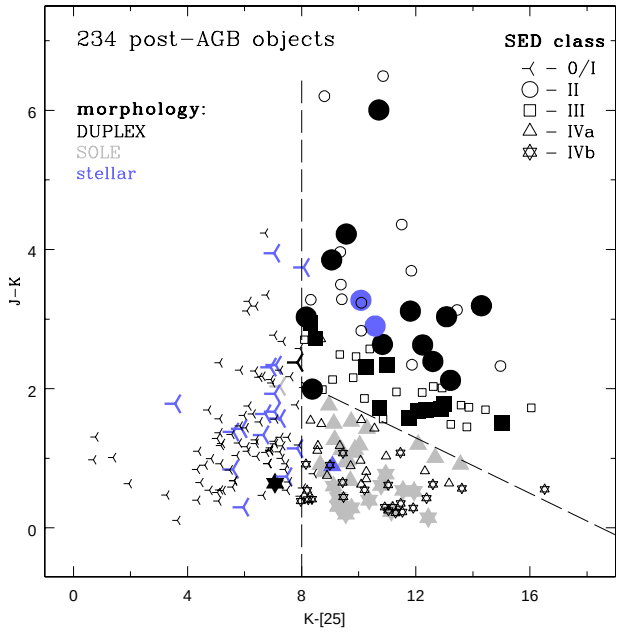

Fig. 2. Color-color diagram for *very likely* post-AGB objects with specified SED classes. Objects observed with HST are indicated by larger symbols and divided into morphological classes by different colors: black ones - DUPLEXes; light grey ones - SOLEs; dark grey (violet in electronic version) symbols - stellar–like objects. The SED classes are indicated by the symbols of different shape, as listed in the figure.

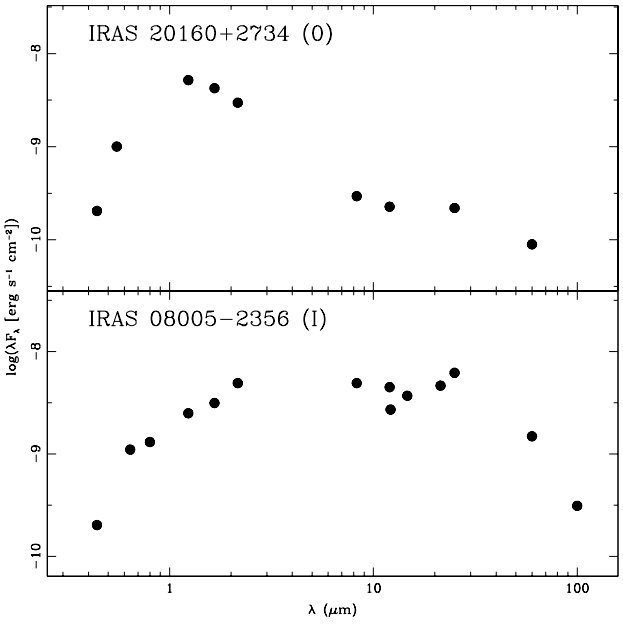

Fig. 1. Comparison between spectral energy distributions of 2 post-AGB objects with SED of class O introduced by us (upper panel) and class I defined by van der Veen et al. (1989) (lower panel).

2.7. On line availability, further versions and reference

The present version of the catalogue is available on-line at http://www.ncac.torun.pl/postagb2 (the first version is still available at http://www.ncac.torun.pl/postagb). As stated in the introduction, all the data gathered for the catalogue (photometry, spectra, images, classifications) are now made available not only for the *very likely* post-AGBs but also for objects classified as *possible* post-AGBs.

Note that future releases of the catalogue involving only minor changes or updates will be made only in an on-line version. Roughly, we plan to issue new versions every two or three years.

To mention the catalogue of Galactic post-AGB objects, please refer to Szczerba et al. (2007) and the number of the version. For the present version, the reference should be Szczerba et al. (2007), version 2.0. The present paper is to be referred to if discussing an aspect specific to version 2.0.

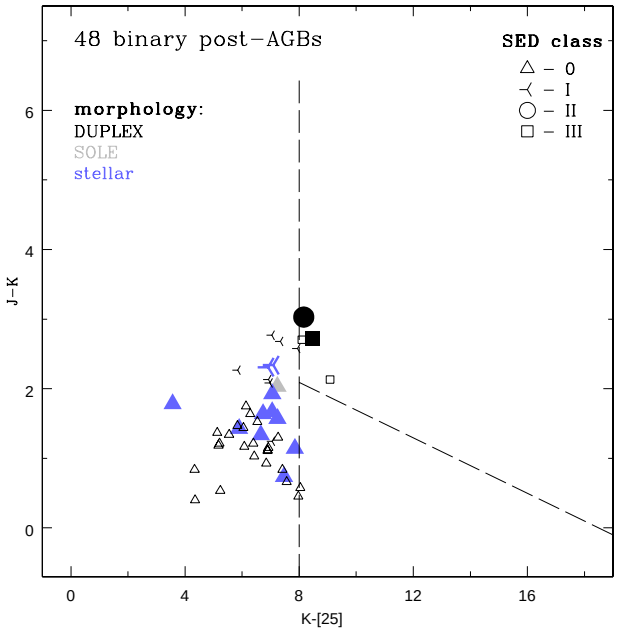

Fig. 3. Same as Fig.2, but only for known binary post-AGB objects. Now class I/O has been split into separate classes.

3. Discussion

3.1. The relation between colors, SED classes and morphological classes

In Fig.2, we plot in the near-IR/mid-IR two-color diagram ((J-K) vs. (K-[25])) all the very likely post-AGBs from our catalogue that have specified SED classes (234 objects) defined in Sect 2.4, with different symbols, as indicated in the caption. With bigger symbols we marked those objects that were observed with HST, and based on available HST images we were able to classify them morphologically into DUPLEXes (black symbols) and SOLEs (light grey symbols). Stellar-like objects are represented with dark grey (violet in electronic version) symbols. The two dashed lines are the lines similar to those introduced in Siódmiak et al. (2008), which empirically divide the zones containing the different morphological classes. Originally they were based on the consideration of a sample of 66 objects. Now, with significantly larger number of objects, we realized that the vertical line K-[25]=8 separates SOLEs and DUPLEXEes from the stellar like objects, while the inclined one is a meaningful only for division between SOLEs and DUPLEXes, both of which are located to the right of the vertical line. We clearly see that the boundaries drawn by Siódmiak et al. (2008) still work extremely well, meaning that there is a clear correlation between the infrared colors of post-AGB objects and their morphologies.

Except for a few objects (e.g., Frosty Leo - DUPLEX object with SED of class IVb lying among stellar-like objects, or 2 stellar-like objects with SED of class II which most probably are DUPLEXes seen pole-on), it is clear that the different SED classes occupy distinct regions in this diagram: Class O/I objects occupy the same region as stellar-like objects. Classes II and III occupy the same region as DUPLEX objects, with class II lying above class III. Class IVa and IVb lie in the same region as SOLE objects, with class IVa lying above class IVb. As a matter of fact, it is no surprise that each SED class is related to a specific region in the two color diagram (J-K, K-[25]). The importance of this diagram is to show that, even with as little information as just the J, K and [25] magnitudes, one can distinguish several, clearly defined morphological classes of post-AGB objects.

We see that the SED classes of the post-AGBs without morphological classifications (smaller symbols) occupy the same regions as post-AGB objects with morphological classification. Using this diagram, one can thus predict the morphological appearance of a given source.

3.2. Binarity

Figure 3 is identical to Fig.2, except that it plots only objects that are known to be binaries (see Paper I for details). In addition class O/I has been divided into class O (see inset in Fig.3). Class I binary sources are redder in J-K color and are located above class O binaries. Most of the plotted 48 binaries have SEDs of class O/I and are stellar-like on HST images. This suggests that class O/I objects might contain a large proportion of yet unknown binaries. The similarity of shapes of the SEDs among binary post-AGB stars were investigated in more details by de Ruyter et al. (2006). The authors concluded that the broad-band characteristics of such SEDs are best interpreted assuming that the circumstellar dust is stored in Keplerian rotating passive disks. Physically those with SED class I might contain warm and those with SED class 0 cold disks.

3.3. Post-ABG objects with M-type stars?

There is no consensus on how to define the end of the AGB. Soker (2008) listed the different criteria that have been proposed to define the transition from the AGB to the post-AGB phase. These include, among others, a drop in the mass-loss rate (used by Suárez et al. 2006), a pulsation period reaching 100-150 days (Blöcker 1995), the effective temperature reaching 5000 K (Schönberner 1981). Soker (2008) proposes a new criterion, based on the ratio of the dynamical timescale to the envelope thermal time scale. In a model with core mass of 0.67 $M_{\odot}$ from the solar metallicity track of Vassiliadis & Wood (1994) Soker's criteria imply an effective temperature during the transition AGB – post-AGB larger than 5000 K. Note in addition that all the stellar evolution models defining the AGB – post-AGB transition with different criteria suggest that the effective temperature during the termination of AGB is above 4000 K (e.g., Vassiliadis & Wood 1994; Blöcker 1995; Forestini & Charbonnel 1997; Weiss & Ferguson 2009).

However, while preparing the first version of the catalogue, we noted that some objects referred to as post-AGBs in the literature, have M-type stars, implying an effective temperature around 3000 K. As discussed by Szczerba et al. (2001), at least in the case of H-burning models, a low temperature of the central star (below about 4000 K or spectral type later than K) at

the beginning of the post-AGB evolution would result in a too long evolution during the proto-planetary phase and a full dispersion of matter before ionization. If we refer to Figs. 3 and 4 of Frankowski (2003), which are based on stellar evolution models of Vassiliadis & Wood (1993) and Vassiliadis & Wood (1994), we see that for temperatures smaller than 3500 K, the mass of the hydrogen-rich envelope is still larger than about $0.05\,M_\odot$. Given that the nuclear consumption rate is typically $10^{-7}\,M_\odot\,yr^{-1}$ (e.g. Schonberner 1989), this means that, in absence of a strong mass-loss, about 10^5 yr would be necessary to get rid of this envelope and attain temperatures of several tens of thousands degrees. While a post-AGB nature is not incompatible with such large time scales of evolution for low mass stars (say $M \leq 0.55\,M_\odot$), we note that our M-type post-AGB objects have already a quite significant infrared excess (as inferred from the height of the IR peak relative to the height of the optical one) seen in their double-peaked SEDs . This suggests a large mass loss rate at the end (?) of their AGB evolution, opposite to what is expected for low mass stars (the lowest mass stars probably have the lowest mass loss rates at the end of AGB and therefore they should show the smallest infrared excesses). The only case of small infrared excess among M-type sources is RV Tau-type star EG Lyr, which has single-peaked SED with maximum at near-IR wavelengths.

To make progress on this issue, we obtained new optical spectra of four post-AGB candidates with M-type spectra in order to confirm their spectral classification. The optical observations were carried out on July and August 2009 with the 2.5m Nordic Optical Telescope (NOT) in La Palma using ALFOSC in spectroscopic mode, with a slit of 0.5″ and grism 8, which gives a resolution of about 2000 and covers the spectral range 5825-8350 Å. The reduction was performed using standard procedures, with the IRAF package. The flux calibration, using spectrophotometric standard stars, was performed. There were two exposures for each target star, one short and one long; the final, flux-calibrated spectra are obtained from the long exposures only.

In Fig. 4, we show the obtained optical spectra of four objects we were able to observe. Three of them have a confirmed M type: 16476−1122 (M2 I); IRAS 17433−1750 (M2 I) and IRAS 19225+3013 (M3 II). IRAS 17253−2831 is actually of F7 I type. Suárez et al. (2006) mentioned that the previous observation of this source was probably not taken for the real counterpart. Is easy to make such a mistake when the post-AGB source is a heavily obscured in the optical and lies in a crowded field. Our estimations of spectral types are shown in the column marked "spectral type other" followed by SZ:.

There could be also a confusion between post-AGB objects and young stellar objects which also may show double peaked SEDs. However, main sequence or pre-main sequence stars are known to have surface gravities typical for dwarfs – luminosity class V, or intermediate between dwarfs and giants (luminosity class III). Note, that our sample of post-AGB objects with M-type spectra has almost always a surface gravity typical for supergiants – luminosity class I. On the other hand there is a group of red supergiants (e.g., Betelgeuse or Antares) which have spectral types similar to our post-AGB sources (M2Iab, M1.5Iab-b, respectively, according to SIMBAD). However,

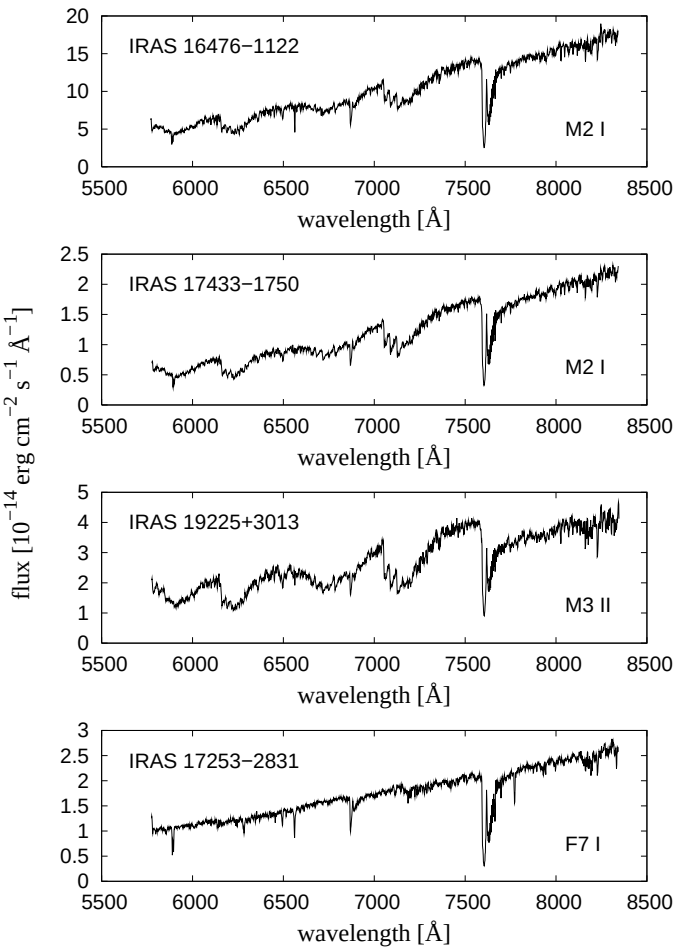

Fig. 4. Optical spectra obtained with the NOT 2.5 m telescope at La Palma. IRAS name and spectral type estimated from the spectra are shown in the left top and the right bottom part of each panel.

these supergiants do not show double peaked shape in their SEDs (e.g., Justtanont et al. (1999)). Therefore, we are convinced that at least some of our M-type objects are genuine post-AGB objects.

In the present version of the catalogue we have included M-type RV Tau stars (which as a group are considered to be post-AGB objects) as *very likely*. These are: EG Lyr with spectral type M5III as given by SIMBAD and GK Car with spectral type M0I as given by de Ruyter et al. (2006). Three other sources (IRAS 07430+1115, IRAS 16279−4757 and IRAS 17253−2831) with spectral type M are also classified now as *very likely*. IRAS 07430+1115 is confirmed to show 21 μm emission (Hrivnak et al. 2009), which is seen only in post-AGB objects. We have checked that the optical spectrum of Suárez et al. (2006) shows absorption bands of C_2 and C_3 (see their Fig. A1). It means that the M-spectral type was mistakenly attributed to this C-rich source. IRAS 16279−4757 shows the presence of the aromatic infrared bands (see Matsuura et al. 2004). It seems to be unlikely that an M-type source is able to excite these bands , so it may be that a wrong counterpart was observed by Suárez et al. (2006). In case of IRAS 17253−2831 our new observations have shown

that spectral type is in fact F7 I, so probably the previous observation was made also on a wrong star (see Sect. A.2 for details).

The remaining 9 objects which have spectral classification of M-type are counted now as *possible* (*they were disqualified* - in the first edition of the catalogue). They are: IRAS 05089+0459 (M3 I); IRAS 07227−1320 (M1 I); IRAS 13010−6012 (M2 I); 15406−4946 (M4 II); IRAS 16476−1122 (M1 I, M2 I - our observations); IRAS 17223−2659 (M5 III); IRAS 17433−1750 (M2 I, M2 I - our observations); IRAS 18420−0512 (M1 I); IRAS 19225+3013 (M2 II, M3 II - our observations), They have double-peaked SEDs, luminosity class I (for two exceptions see below) and low IRAS variability index (below 15 percent). In addition, the MSX variability flags (for sources which were observed by MSX) are 0, except for band C (at 12.13 μm) for IRAS 07227−1320 where it is 1 (a variability of 3.8 σ has been reported). Therefore, taking into account the above information we expect that these objects may be genuine post-AGB objects. However, as we discussed in Sect A.2 in the case of IRAS 15406−4946 and IRAS 17223−2659, a wrong star might have been observed. On the other hand, in at least 5 sources (IRAS 05089+0459, IRAS 07227−1320, IRAS 16476−1122, IRAS 17433−1750 and IRAS 19225+3013), this is probably not the case, since the striking match between optical spectroscopy and photometry suggest that the correct counterpart was observed. In these cases a large IR excess and M-type central source seems to be a good example of a discrepancy between theory and observations. In one case (IRAS 13010−6012) the optical spectrum is below the photometric data (it may be understood, for example, by bad weather conditions during observations), and in one case (IRAS 18420−0512), the optical spectrum is above (probably a result of incorrect calibrations). In both cases the shape of optical spectrum follows that of photometry.

In view of the above, we expect that objects in our catalogue that have been classified as *very likely* or *possible* post-AGBs and have an M-type spectrum could be actually low mass AGB stars that have just experienced a strong mass loss episode (the only explanation for strong infrared excess among low mass stars). Whether they will really spend as long time as expected before they start faster evolution along post-AGB phase, or whether they will experience another event(s) of a strong mass loss episode is not clear. If the second possibility is the case, then we may expect that they could become precursors of post-AGBs with circumstellar arcs (see e.g., Kwok et al. 1998; Sahai et al. 1998). In fact, the second possibility is already seen in IRAS 18420−0512, which was observed by HST and shows a pattern of circumstellar arcs (Sahai et al. 2007). Thus, according to the proposed scenario, post-AGB stars which have circumstellar arcs and earlier than M spectral types already have had passed through the instabilities which resulted in circumstellar arcs, while those with M-type are still in this instability phase.

4. Summary

We have performed a significant upgrade to our *Toruń catalogue of Galactic post-AGB and related objects* by adding new objects. The present version of the catalogue now contains 474 *very likely* or *possible* post-AGB objects. Because the distinction between these two subclasses is not always clear and may change when future observations become available, we have decided to give on-line access to the data gathered for both subclasses.

We have added direct access to the HST images that were available for the sources in the catalogue.

We have performed a spectral classification of the sources following the classification scheme of van der Veen et al. (1989), adding a class O to represent SEDs with a blue spectrum and a very small infrared excess. 366 objects have had their SEDs classified.

We have repeated the analysis of Siódmiak et al. (2008), showing that there is a strong correlation between morphology and location in the two-color diagram (J-K, K-[25]). This diagram now contains 234 objects (instead of 66 in Siódmiak et al. (2008)). We have also found that objects known to be binaries have SEDs of class O/I and are predominantly stellar-like on HST images, suggesting that class O/I objects might contain a large number of yet unknown binaries.

Some of the post-AGB objects in our catalogue are found to have have M-type spectral types. We argue that such cases are difficult to understand in the framework of the present post-AGB theory. We have suggested that they could be post-AGB stars that experienced an exceptional episode of high mass loss rate which may be repeated several times until most of the H-rich envelope will be lost, producing post-AGB objects with circumstellar arcs.

Updates of this catalogue will be released approximately every two-three years on http://www.ncac.torun.pl/postagb2. We would be grateful for sending us any relevant information that can help us improve this data base.

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Appendix A: Development of the catalogue

A.1. Updates

The present version of the catalogue has opened entries for *possible* post-AGB objects (the entries for *unlikely* objects remain closed). Photometric and spectroscopic data are available now for 474 sources (391 *very likely* and 83 *possible* post-AGB objects). To allow an efficient search among the different parts of the catalogue, we have included the possibility of querying the database by searching all sub-catalogues for a given object name. This may be done directly from the home page of the catalogue or by means of the "Search" button inside each of the sub-catalogues. Because the SIMBAD post-AGB database now includes many of the names which were marked by "*" in the previous version of the catalogue (meaning that this counterpart was found by us), in this version we have removed all "*" even if the given name is still not in the SIMBAD database.

The spectroscopic atlas of post-AGB stars and planetary nebulae presented by Suárez et al. (2006) contains low-resolution optical spectroscopy, finding charts and improved astrometric coordinates of a sample of 253 IRAS sources. The objects are divided in several groups, among which there are 102 sources classified as post-AGB stars, 21 as "transition sources", and 36 as planetary nebulae. 121 of them[1] together with their spectra (if available) were included in the present version of the Toruń catalogue (85 as *very likely*, 30 as *possible* and 6 as *unlikely* post-AGB objects). The spectral types determined by Suárez et al. (2006) are also added, followed by "S:" and they appear independently of the spectral type from SIMBAD, in the column marked "Spectral type other".

In addition, a spectroscopic survey of 16 post-AGB candidates performed by Pereira & Miranda (2007) provided low resolution optical spectra for 10 objects which were or are included into our catalogue (9 as *very likely* or *possible* post-AGB objects and 1 as *unlikely*). We did not include objects classified by Pereira & Miranda (2007) as non-post-AGB, except for IRAS 18044−1303, which is now classified as *unlikely* but was *possible* in the previous version of the catalogue. These optical spectra and their spectral types are also included independently of the SIMBAD spectral type and are followed by "PM:" in the column marked "Spectral type other".

The release of the Guide Star Catalog (GSC), Version 2.3.2 (STScI & OATo 2007) allowed us to add photometry at Bj (blue), V (green), F (red), and N (0.8 μm) photographic bands to the catalogue. The limits on brightness which existed in the previous version of GSC were removed and hence data for more objects are available. However, we left the GSC2.2 photometry in our catalogue for comparison.

New objects were added to each of the 3 categories in our catalogue, some sources were removed and some others were moved between sub-catalogues. Changes are described in detail in Sect.A.2 and in the log file in our catalogue. In summary, the present version of the sub-catalogue concerning *very likely* post-AGBs contains 391 sources (65 more than the previous version - see Paper I). The number of *very likely* post-AGBs increased due to:

- the re-classification of 32 sources from *possible* to *very likely* due to the increased number of references[2] in ADS (as the end of 2009) to five or more;
- adding 30 sources, which were missing in the previous version of the catalogue - 16 R CrB stars, 7 RV Tau stars and 7 "genuine" post-AGBs;
- the re-classification of 2 RV Tau stars from *possible* to *very likely* due to the "redefinition" of our criteria;
- the re-classification of 3 possible objects from *possible* to *very likely* due to the discovery of their RV Tau star's nature;
- re-classifying 1 *possible* post-AGB object (IRAS 14072−5446) as *very likely*.

However, 2 *very likely* objects (IRAS 17433−1750 and IRAS 21537+6435) were moved to the *possible* post-AGBs and 1 *very likely* object (IRAS 01174+6110) was moved to the *unlikely* list.

The present number of *possible* post-AGBs is 83 (24 less than in the previous version of the catalogue). This is the result of removing 40 objects, due to:

- the re-classification of 32 sources as being now *very likely* post-AGBs due to the increased number of references in ADS (see above);
- the re-classification of 2 RV Tau stars as being now *very likely* post-AGBs;
- the re-classification of 3 possible objects as being now *very likely* RV Tau stars;
- moving IRAS 14072−5446 to *very likely* post-AGBs;
- moving IRAS 18044−1303 to *unlikely* post-AGBs;
- removing IRAS 17516−2526 from the catalogue.

On the other hand, 16 sources have been added to the *possibles*:

- 2 which were moved from *very likely*;
- 1 which was moved from *unlikely*
- 6 which were missing in our catalogue, but still have not enough bibliographic entries in ADS to be included as *very likely*;
- 6 objects (IRAS 05089+0459, IRAS 07227−120, IRAS 15406−4946, IRAS 16476−1122, IRAS 17223−2659 and IRAS 19225+1950) with M-type

[1] We have excluded 2 objects considered post-AGB stars and 2 considered as transition source because they are in fact PNe. They are: IRAS 17300−3509, IRAS 17579−3121, IRAS 17347−3139, and IRAS 17466−3031 (see Acker et al. 1992). However, we have included as *very likely* post-AGB the object IRAS 17381−1616, which was classified as a PN, but is a post-AGB object of spectral type B1Ibe.

[2] We did not count our Paper I as a reference. Therefore objects with 5 references in ADS, including our paper, are still counted as *possible* post-AGB objects. They can be recognized by the phrase "but only 5(-1) bibliographic entries in the ADS".

central stars (as classified by Suárez et al. 2006) have been moved from *unlikely* to *possible*;
– 1 missed object of uncertain nature: IRAS 19312+1950.

Finally, 66 objects are classified as *unlikely* post-AGBs (2 more than in the previous version of the catalogue). 6 objects with M-type stars were intentionally moved to *possible*, IRAS 18420−0512 was also moved to *possible* and IRAS 15154−5258 has been removed from the catalogue since it is classified as [WR] planetary nebula.

However, 10 objects have been added as *unlikely*: 1 object moved from *possible* (IRAS 18044−1303); 1 object moved from *very likely* (IRAS 01174+6110); HD 319896 is not a counterpart of the *possible* post-AGB object IRAS 17277−3506; and 7 objects added from SIMBAD which were missing in the previous version of the catalogue (see Sect. A.2 for details).

There is still one group of objects considered as post-AGB in the literature which is intentionally not included in our catalogue. These are non-variable OH/IR stars (Habing et al. 1987), or, speaking more generally, objects in transition from AGB to post-AGB. We plan to cover this topic in the next edition of the catalogue.

A.2. Notes on individual objects

For brevity, below we label " *very likely* post-AGB object " by "*vl*", " *possible* post-AGB object " by "*p*", and " *unlikely* post-AGB object " by "*u*".

IRAS 01174+6110 - *u* : This source was *very likely* in the previous version of the catalogue. It is a HII region (Kelly & Hrivnak 2005; Suárez et al. 2006).

IRAS 01259+6823 - *vl* : This source was missed in the previous version of the catalogue. Its post-AGB nature was discussed in particular by Kelly & Hrivnak (2005) and Suárez et al. (2006).

IRAS 05089+0459 - *p* : This object (its spectral type is M3I) was *disqualified* (*unlikely*) in the previous version of the catalogue. However, it has a double-peaked energy distribution and luminosity class I, so it has been upgraded to *possible*. Inside the IRAS error ellipse there is only one 2MASS source (05113615+0503262).

IRAS 05113+1347 - *vl* : This object is now confirmed by Spitzer Space Telescope to be a 21μm source (Hrivnak et al. 2009).

IRAS 05280+3817 - *vl* : This source was missed in the previous version of the catalogue. It is a RV Tau star.

IRAS 06530−0213 - *vl* : This object is now confirmed by Spitzer Space Telescope to be a 21μm source (Hrivnak et al. 2009).

IRAS 07018−0513 - *p* : This source has been incorrectly attributed by Oudmaijer et al. (1992) to HD 53300 = SAO 134141. This wrong identification is followed by SIMBAD. The correct counterpart of IRAS 07018−0513 seems to be MSX G219.1270+00.4428 source, which lies in the error ellipse of the IRAS source and is located only about 9″ from the IRAS position almost along the major error ellipse axis. The MSX fluxe of about 0.5 Jy in band A at 8.28μm (at other MSX bands only limits are available) may be compared with the IRAS flux at 12μm of 0.75 Jy. There is no other MSX sources around and, therefore, we believe that the MSX source is the proper counterpart of IRAS 07018−0513. The only optical counterpart may be found in the USNO-A2.0 Catalogue (Monet et al. 1998). Therefore, for this specific case, the object USNO-A2.0 0825-03845665 and its photometry at *B* and *R* bands has been introduced in the GSC2.2 entry of the catalogue.

IRAS 07227−1320 - *p* : The object (its spectral type is M1I) was *disqualified* (*unlikely*) in the previous version of the catalogue. However, it has a double-peaked energy distribution and has luminosity class I, so it has been upgraded to *possible*. Inside the IRAS error ellipse there is only one MSX (G228.6982+01.1764) and one 2MASS (07250306-1326199) source.

IRAS 07430+1115 - *vl* : This object is now confirmed by Spitzer Space Telescope to be a 21μm source (Hrivnak et al. 2009).

IRAS 08281−4850 - *vl* : This source was a *possible* in the previous version of the catalogue due to the small number of references in ADS. It is an A-type post-AGB star with s-process enrichment (Reyniers et al. 2007).

IRAS 10174−5704 - *vl* : This source was a *possible* in the previous version of the catalogue due to the small number of references in ADS. It is a RV Tau object from the list of 20 newly characterized stars by de Ruyter et al. (2006).

IRAS 10178−5958 - *vl* : This source was missed in the previous version of the catalogue. It is a bipolar proto-planetary nebula (e.g., Sahai et al. 2007; Parthasarathy et al. 2001) and was introduced as transition object in Suárez et al. (2006).

IRAS 11118−5726 - *vl* : This source was a *possible* in the previous version of the catalogue due to its spectral type M0I. It is a RV Tau star.

IRAS 11353−6037 - *vl* : This source was a *possible* in the previous version of the catalogue due to the small number of references in ADS.

IRAS 11381−6401 - *vl* : This source was a *possible* in the previous version of the catalogue due to the small number of references in ADS. Its spectral energy distribution has a double-peaked shape characteristic for post-AGB objects.

IRAS 11531−6111 - *p* : This object was missed in the previous version of the catalogue. It has a double-peaked SED and was classified as transition object in Suárez et al. (2006). It is a *possible* object in our catalogue due to the small number of references in ADS.

IRAS 12302−6317 - *vl* : This source was a *possible* in the previous version of the catalogue due to the small number of references in ADS. It was introduced as a post-AGB object in Suárez et al. (2006).

IRAS 12309−5928 - *vl* : This source was a *possible* in the previous version of the catalogue due to the small number of references in ADS. It is a heavily obscured post-AGB star (Ramos-Larios et al. 2009).

IRAS 12419−5414 - *vl* : This source was missed in the previous version of the catalogue. It is a well known reflection nebula (Sahai et al. 2007).

IRAS 13010−6012 - *p* : Information about the spectral type (M2I - Suárez et al. 2006) of this source was missing in the previous version of the catalogue. The object has a double-peaked SED and has luminosity class I, so it is classified as *possible* post-AGB object. Inside the IRAS error ellipse there is only one 2MASS (13040549-6028456) and one MSX (G304.4917+02.3547) source.

IRAS 13203−5917 - *vl* : This source was a *possible* in the previous version of the catalogue due to the small number of references in ADS.

IRAS 13404−6059 - *vl* : This source was a *possible* in the previous version of the catalogue due to the small number of references in ADS. It is a heavily obscured post-AGB star (Ramos-Larios et al. 2009).

IRAS 13421−6125 - *vl* : This source was a *possible* in the previous version of the catalogue due to the small number of references in ADS.

IRAS 13500−6106 - *vl* : This source was a *possible* in the previous version of the catalogue due to the small number of references in ADS. It is a heavily obscured post-AGB star (Ramos-Larios et al. 2009).

IRAS 13529−5934 - *vl* : This source was a *possible* in the previous version of the catalogue due to the small number of references in ADS. Ramos-Larios et al. (2009) found an optical counterpart to this source.

IRAS 13557−6442 - *vl* : This source was missed in the previous version of the catalogue. It is a bipolar proto-planetary nebula (Sahai et al. 2007).

IRAS 14072−5446 - *vl* : In the previous version of the catalogue this source was mistakenly considered as a possible OB star and treated, therefore, as a *possible*. It is a hot post-AGB star (Parthasarathy et al. 2000).

IRAS 14104−5819 - *vl* : This source was a *possible* in the previous version of the catalogue due to the small number of references in ADS. It is a heavily obscured post-AGB star (Ramos-Larios et al. 2009).

IRAS 14325−6428 - *vl* : This source was a *possible* in the previous version of the catalogue due to the small number of references in ADS. It is an A-type post-AGB star with s-process enrichment (Reyniers et al. 2007).

IRAS 14482−5725 - *vl* : This source was a *possible* in the previous version of the catalogue due to the small number of references in ADS.

IRAS 14527−6204 - *vl* : This source was a *possible* in the previous version of the catalogue due to the small number of references in ADS.

IRAS 15154−5258. This object is a well known [WR] PN (PN G324.0+03.5) and there is no doubt about its nature (e.g., Manchado et al. 1989b; Acker et al. 1992; Acker & Neiner 2003; Kerber et al. 2003). Thus it has been removed from the *unlikely* list.

IRAS 15210−6554 - *vl* : This source was a *possible* in the previous version of the catalogue due to the small number of references in ADS.

IRAS 15310−6149 - *vl* : This source was a *possible* in the previous version of the catalogue due to the small number of references in ADS. It has a double-peaked SED and was classified as a post-AGB star in Suárez et al. (2006).

IRAS 15406−4946 - *p* : This object (its spectral type is M4II) was *disqualified* (*unlikely*) in the previous version of the catalogue. However, it has a double-peaked energy distribution, so it has been upgraded to *possible*. The only MSX source (G329.1514+03.9200) inside the IRAS error ellipse is located about 18″ from the nominal IRAS position. The corresponding 2MASS source is 15442051-4956241 and its optical counterpart in GSC 2.3.2 catalogue is S8U4108432. This GSC source has (somewhat strange) photometry, which does not match spectrum of Suárez et al. (2006) (see SED of this source in or catalogue). However, we have checked that another GSC 2.3.2 object (S8U4074386), which is located only about 4″ from the 2MASS source towards NE has photometry matching very well the optical spectrum. Therefore, we expect that in this case a wrong counterpart was observed.

IRAS 15544−5332 - *vl* : This source was a *possible* in the previous version of the catalogue due to the small number of references in ADS. It is a “water fountain source” (e.g., Imai et al. 2007).

IRAS 15556−5444 - *vl* : This source was a *possible* in the previous version of the catalogue due to the small number of references in ADS. It is a RV Tau star.

IRAS 16283−4424 - *p* : This object was missed in the previous version of the catalogue. It has a double-peaked SED and was classified as a post-AGB object in Suárez et al. (2006). It is a *possible* object in our catalogue due to a small number of references in ADS.

IRAS 16476−1122 - *p* : This object (its spectral type is M1 I or M2 I - this paper) was *disqualified* (*unlikely*) in the previous version of the catalogue. However, it has a double-peaked energy distribution and luminosity class I, so it has been upgraded to *possible*. Inside the IRAS error ellipse there is only one 2MASS source (16502429-1127577).

IRAS 16552−3050 - *vl* : This source has been incorrectly attributed by us to 2MASS source 16582776-3055062. According to Suárez et al. (2008) this objects is an obscured post-AGB not associated with any optical counterpart and has high-velocity bipolar water maser, it is thus a water fountain star.

IRAS 17223−2659 - *p* : This object was *disqualified* (*unlikely*) in the previous version of the catalogue. The source is located in the crowded region. In the IRAS error ellipse there are at least four 2MASS sources, but only one MSX object (G359.1995+04.7774) which is located about 3 ″ from the nominal IRAS position. There are two 2MASS sources in the vicinity of the MSX source (3.6 and 5.5″ from the MSX position). For the presentation in the catalogue we have chosen 2MASS object (17252662-2702013) which is located at distance of 5.5″ from the MSX position. We have checked, however, that selecting the closer 2MASS source, which is weaker, do not change much the picture. We note, that the slope of the optical spectrum (its spectral type is M5 III) does not fit to the slope of the photometry. It may suggest that a wrong counterpart was observed by Suárez et al. (2006), and therefore we have upgraded this double-peaked SED source to *possible*.

IRAS 17253−2831 - *vl* : This source was missed in the previous version of the catalogue. Suárez et al. (2006) classified it as a post-AGB object of M4II spectral type. The

source is located in the crowded region, with three 2MASS sources inside the IRAS error ellipse, but only one MSX source (G358.3116+03.3617). The optical spectrum of Suárez et al. (2006) seemed to have wrong slope, what suggested that a wrong counterpart was observed. Therefore, we have re-observed optical counterpart of this object selecting the closest 2MASS counterpart (17283296-2833258). Its optical spectrum is classified as F7 I and source was counted as *very likely* post-AGB object.

IRAS 17291−2402 - *vl* : This source was missed in the previous version of the catalogue. The effective temperature is 6000 K (Reddy & Parthasarathy 1996), but the source is sometimes classified as planetary nebula PN G002.5+05.1 (e.g., Kerber et al. 2003). It is a transition object in Suárez et al. (2006).

IRAS 17310−3432 - *vl* : This source was a *possible* post-AGB in the previous version of the catalogue due to the small number of references in ADS. It has a double-peaked SED and was classified as a post-AGB object in Suárez et al. (2006).

IRAS 17326−3324 - *u* : This source was missed in the previous version of the catalogue, and is classified as post-AGB object by SIMBAD. However, this is a massive supergiant in a cluster (Massey et al. 2001) and thus we treat it as an *unlikely* object in our catalogue.

IRAS 17364−1238 - *vl* : This source was a *possible* in the previous version of the catalogue due to the small number of references in ADS.

IRAS 17370−3357 - *vl* : This source was a *possible* in the previous version of the catalogue due to the small number of references in ADS.

IRAS 17392−3020 - *vl* : This source was a *possible* in the previous version of the catalogue due to the small number of references in ADS. It was considered as a post-AGB object by Suárez et al. (2006).

IRAS 17424−2331 - *vl* : This object was missed in the previous version of the catalogue. It is a R CrB star in the Galactic Bulge (Tisserand et al. 2008).

IRAS 17433−1750 - *p* : The object was considered as a *very likely* post-AGB object in the previous version of the catalogue. García-Hernández et al. (2007) classified it as O-rich AGB star (its spectral type is M2 I - (Hu et al. 1993) and this paper). It has double-peaked SED and luminosity class I. Therefore, as for other post-AGBs with M-type central stars, we have decided to move it to our *possible* list.

IRAS 17440−3310 - *p* : This object was missed in the previous version of the catalogue. It has a double-peaked SED and was considered as a young proto-planetary nebula by Sahai et al. (2007). It is a *possible* object in our catalogue due to the small number of references in ADS.

IRAS 17476−4446 - *vl* : This source was a *possible* in the previous version of the catalogue due to the small number of references in ADS.

IRAS 17488−1741 - *vl* : This source was a *possible* in the previous version of the catalogue due to the small number of references in ADS. It has a double-peaked SED and was classified as a post-AGB star in Suárez et al. (2006).

IRAS 17516−2526. This is the same object as the *very likely* post-AGB object IRAS 17516−2525, so it was removed from our catalogue. The name "IRAS 17516−2526" was included in Manchado et al. (1989a).

IRAS 17542−0603 - *vl* : This source was a *possible* in the previous version of the catalogue due to the small number of references in ADS. It was introduced as a post-AGB object in Kelly & Hrivnak (2005) and Suárez et al. (2006).

IRAS 17576−2653 - *vl* : This source was a *possible* in the previous version of the catalogue due to the small number of references in ADS. Its SED has a double-peaked shape and it is a post-AGB object in Suárez et al. (2006).

IRAS 18044−1303 - *u* : The object has been moved from *possible* to *unlikely* since it is a Young Stellar Object and not a post-AGB star according to Pereira & Miranda (2007).

IRAS 18096−3230 - *p* : Suárez et al. (2006) observed the object at a position that corresponds to GSC2.2 source S301310298380, while the correct counterpart of IRAS 18096−3230 is located inside the IRAS error ellipse and corresponds to the 2MASS source 18125855−3230038 (9.7″ from the nominal IRAS position). It has an optical counterpart in the NOMAD Catalog (Zacharias et al. 2004) NOMAD1 0574-0991490 and, exceptionally, this photometry at *B* has been introduced in the GSC2.2 entry of our catalogue.

IRAS 18100−2750 - *vl* : This object was missed in the previous version of the catalogue. It is a R CrB star in the Galactic Bulge (Tisserand et al. 2008).

IRAS 18113−2503 - *vl* : This source was a *possible* in the previous version of the catalogue due to the small number of references in ADS. Ramos-Larios et al. (2009) found an optical counterpart to this source.

IRAS 18158−3445 - *vl* : This source was a *possible* in the previous version of the catalogue due to the small number of references in ADS. It is a RV Tau star.

IRAS 18321−1401 - *p* : This source was missed in the previous version of the catalogue. Its spectrum shows characteristic features of a post-AGB object (Pereira & Miranda 2007), but due to a small number of references we classified it as a *possible*.

IRAS 18365+5154 - *p* : This source was missed in the previous version of the catalogue. It is not R CrB star (Hesselbach et al. 2002) and thus is on our *unlikely* list.

IRAS 18420−0512 - *p* : This source was classified as *disqualified* (*unlikely*) post-AGB in the previous version of the catalogue due to its spectral type M1I given by SIMBAD. The optical spectrum of Suárez et al. (2006) (still classified as M1I) is located above the collected photometry (see SED of this object in our catalogue). This may be, however, effect of the wrong spectrum calibration since the shape of the optical spectrum match very well shape of the collected photometry. There is good coincidence between IRAS, MSX and 2MASS positions. The other closest source is located 11″ away and is fainter in optical than the selected GSC source S9NC057178. The source has double-peaked SED, has an elongated shape on the HST images by Sahai et al. (2007) and luminosity class I.

IRAS 18489−0629 - *p* : This source was missed in the previous version of the catalogue. Similarly to IRAS 18321−1401, this object was observed by Pereira & Miranda (2007). The small number of references allowed us to classify it only as *possible* post-AGB.

IRAS 18539+0549 - *vl* : This object was missed in the previous version of the catalogue. Characteristic features and the absence of nebular emission lines, allowed Pereira & Miranda (2007) to classify it as a post-AGB star with spectral type G5I.

IRAS 19059+1732 - *p* : This source was missed in the previous version of the catalogue. It is a R CrB star.

IRAS 19090+3829 - *vl* : This source was a *possible* in the previous version of the catalogue due to its spectral type M5III. It is a RV Tau star.

IRAS 19176+1251 - *vl* : This source was a *possible* in the previous version of the catalogue due to the small number of references in ADS. It is a heavily obscured post-AGB star (Ramos-Larios et al. 2009).

IRAS 19225+3013 - *p* : The object (its spectral type is M2II or M3II - this paper) was *disqualified* (*unlikely*) in the previous version of the catalogue. However, it has a double-peaked energy distribution, and luminosity class II, so it has been upgraded to *possible* post-AGB. The 2MASS and optical counterpart of this source is located inside the IRAS error ellipse at about 10″ from the IRAS nominal position. There is no other 2MASS sources inside the IRAS error ellipse.

IRAS 19292+1806 - *p* : This source was missed in the previous version of the catalogue. It is a bipolar proto-planetary nebula (Sahai et al. 2007), but due to the small number of references is classified as a *possible* post-AGB in our catalogue.

IRAS 19312+1950 - *p* : This source was missed in the previous version of the catalogue. The nature of this object is uncertain (e.g., Nakashima & Deguchi 2005) and thus it was added to our *possible* list.

IRAS 19422+1438 - *vl* : This source was a *possible* in the previous version of the catalogue due to the small number of references in ADS. Suárez et al. (2006) and Pereira & Miranda (2007) considered it as a post-AGB object.

IRAS 19477+2401 - *vl* : This object is now confirmed by Spitzer Space Telescope to be a 21μm source (Hrivnak et al. 2009).

IRAS 20174+3222 - *vl* : This source was a *possible* in the previous version of the catalogue due to the small number of references in ADS.

IRAS 20559+6416 - *vl* : This source was a *possible* in the previous version of the catalogue due to the small number of references in ADS. It was introduced as post-AGB object in Kelly & Hrivnak (2005) and Suárez et al. (2006).

IRAS 21289+5815 - *vl* : This source was a *possible* in the previous version of the catalogue due to the small number of references in ADS.

IRAS 21537+6435 - *p* : The object was considered as a *very likely* post-AGB object in the previous version of the catalogue. However, up to now only Volk & Kwok (1989) listed it as proto-planetary nebula. Other publications say nothing about the nature of this object. Hence the status of IRAS 21537+6435 is uncertain.

IRAS 21546+4721 - *vl* : This source was a *possible* in the previous version of the catalogue due to the small number of references in ADS. It has a double-peaked SED and was classified as a transition source by Suárez et al. (2006).

AZ Sgr - *vl* : This source was missed in the previous version of the catalogue. It is a RV Tau star.

BD+10 4058 - *u* : This object was missed in the previous version of the catalogue. It is a normal F-type supergiant and thus is on our *unlikely* list.

HD 319896 - *u* : HD 319896 is classified as T Tau-type star by SIMBAD and IRAS 17277−3506 was attributed to HD 319896 by Pottasch & Parthasarathy (1988). However, the IRAS nominal position is 31.3″ away in the SW direction, while its ellipse error has its major axis only 17″ and position angle of +95° so this association seems to be unlikely. Gledhill (2005) assumed that the counterpart of IRAS 17277−3506 is the 2MASS source 17310400−3508413. However, his observations did not give the final conclusion as far as the nature of this object is concerned, so we keep it still as a *unlikely* post-AGB source.

HD 326971 - *u* : This source was missed in the previous version of the catalogue. It has only 2 references in ADS but there is no evidence for this object being a post-AGB star. Thus it is in our *unlikely* list.

MACHO 176.19607.1138 - *vl* : This object was missed in the previous version of the catalogue. It is a R CrB star in the Galactic Bulge (Tisserand et al. 2008).

Terz V 1680 - *vl* : This object was missed in the previous version of the catalogue. It is a R CrB star in the Galactic Bulge (Tisserand et al. 2008).

Terz V 2046 - *vl* : This object was missed in the previous version of the catalogue. It is a R CrB star in the Galactic Bulge (Tisserand et al. 2008).

Terz V 2960 - *vl* : This object was missed in the previous version of the catalogue. It is a R CrB star in the Galactic Bulge (Tisserand et al. 2008).

[TMW2008] EROS2-GC-RCB-01 - *vl* : This object was missed in the previous version of the catalogue. It is a R CrB star in the Galactic Bulge (Tisserand et al. 2008).

[TMW2008] EROS2-GC-RCB-02 - *vl* : This object was missed in the previous version of the catalogue. It is a R CrB star in the Galactic Bulge (Tisserand et al. 2008).

[TMW2008] EROS2-GC-RCB-03 - *vl* : This object was missed in the previous version of the catalogue. It is a R CrB star in the Galactic Bulge (Tisserand et al. 2008).

[TMW2008] EROS2-GC-RCB-05 - *vl* : This object was missed in the previous version of the catalogue. It is a R CrB star in the Galactic Bulge (Tisserand et al. 2008).

[TMW2008] EROS2-GC-RCB-09 - *vl* : This object was missed in the previous version of the catalogue. It is a R CrB star in the Galactic Bulge (Tisserand et al. 2008).

[TMW2008] EROS2-GC-RCB-11 - *vl* : This object was missed in the previous version of the catalogue. It is a R CrB star in the Galactic Bulge (Tisserand et al. 2008).

[TMW2008] EROS2-GC-RCB-12 - *vl* : This object was missed in the previous version of the catalogue. It is a R CrB star in the Galactic Bulge (Tisserand et al. 2008).

V1135 Sco - *vl* : This object was missed in the previous version of the catalogue. It is a R CrB star in the Galactic Bulge (Tisserand et al. 2008).

V1690 Cyg - *u* : This source was missed in the previous version of the catalogue. It is a misclassified RV Tau and thus is on our *unlikely* list.

V2600 Oph - *vl* : This source was missed in the previous version of the catalogue. It is a RV Tau star.

V532 Oph - *vl* : This object was missed in the previous version of the catalogue. It is a R CrB star Clayton et al. (2009).

V5361 Sgr - *vl* : This source was missed in the previous version of the catalogue. It is a RV Tau star.

V594 Pup - *vl* : This source was missed in the previous version of the catalogue. It is a RV Tau star.

V686 Ara - *vl* : This source was missed in the previous version of the catalogue. It is a RV Tau star.

V691 Ara - *vl* : This source was missed in the previous version of the catalogue. It is a RV Tau star.

V803 Cen - *u* : This source was missed in the previous version of the catalogue. It is not R CrB star (Nagel et al. 2009) and thus is on our *unlikely* list.

V820 Cen - *u* : This source was missed in the previous version of the catalogue. It is not a RV Tau star (Pollard et al. 1996, 1997) and thus is on our *unlikely* list.

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