

# Historical trend of women scientists in Solar system missions: comparisons for ESA and NASA missions

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## Abstract

We will present a comparison of the participation of women scientists in **ESA** (European Space Agency) and **NASA** solar system missions and discuss how this trend changed over time. We counted the science team members of 10 ESA solar system missions over a period of 38 years and 26 NASA robotic planetary missions during a period of 41 years in order to determine the percentage of women on each team.

## 1. Introduction

Two recent studies [1,2] analyzed the participation of women in NASA planetary science and ESA solar system missions. Their analysis shows women scientists to be consistently under-represented in robotic planetary spacecraft missions compared to their representation in planetary science.

## 2. Method

For consistency, both studies [1,2] followed the same methodology described in [3,4]. We therefore considered only the original team scientists: engineers, members of project management, students and postdocs were not included.

For each team, we searched team web pages, published articles and when possible, we directly contacted the Principal Investigators and project scientists. In order to determine gender we relied on personal knowledge, first name or photographs.

One difficulty we encountered was to find the original team members, as often new members are added over time. An additional difficulty was to determine the percentage of women in the field during the missions' selection year, as this information is not easy to obtain, especially for different European countries.

For the NASA missions, due to the low number of instrument PIs for most missions and the lack of more than a single PI for smaller missions, we did not calculate the percentage of women PIs and included both PIs and Co-Is in our totals and percentages.

## 3. Women in the field

It is important to compare the percentage of women in NASA and ESA solar system missions to the percentage of women in planetary science in US and Europe. As preliminary analysis, we analyzed the percentage of women in the International Astronomical Union (IAU) [5,6]. The IAU is an international organization with participation from 68 countries. We limited our analysis only to ESA's 22 Member States (Notice that Luxembourg has not members in the IAU).

The percentage of women in the IAU from all ESA's Member State is 24%. This number varies for each country between 13% of Sweden and Switzerland and 35% of Romania. It is important to notice that not all planetary scientists in Europe are members of IAU, therefore most probably these values underestimates the number of women in the field.

The percentage of women in the general US planetary science community is easier to determine. Using demographic data from the American Astronomical Society's Division of Planetary Science (DPS) and Committee on the Status of Women in Astronomy (CSWA), the percentage of women has increased nearly linearly for the past 30 years is currently near 30% [1].

## 4. Results

### 4.1 ESA statistics:

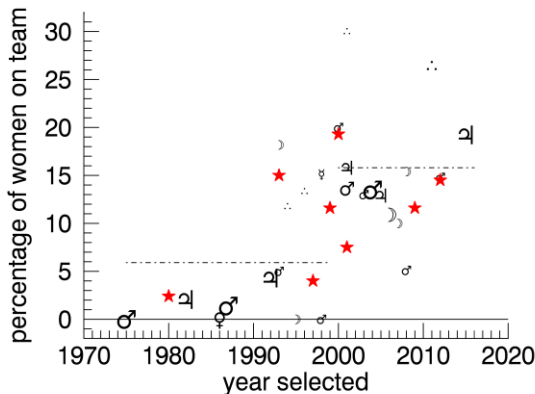
Participation of women in PI teams varied between 4 and 23%, with several missions with no women as PI. Percentages of women participation as Co-I are still

preliminary, as the team members of some missions are still partially incomplete. As preliminary result, the percentage of women as Co-I is always less than 19% and it is not increasing with time. This number is lower than the percentage of women in the IAU from all ESA's Member State (24%).

Selection year	Mission name	% women PI	% women Co-I
1980	Giotto	20	2.4
1993	Rosetta	16.7	15
1997	Cluster	20	4
1998	SMART-1	0	-
1999	Mars Express	0	11.6
2000	BepiColombo	4.3	19.3
2001	Double Star	22.2	-
2001	Venus Express	0	7.5
2009	ExoMars/TGO - Schiaparelli	23	11.6
2012	JUICE	10	14.5

#### 4.2 NASA statistics:

Participation of women in NASA spacecraft science teams varies from none to just over 30% [1]. The percentage has been increasing (**figure 1**). However, this increase is more similar to a step function than a linear increase, with the pre-2000 average at 5.7% and post-2000 at 15.8% (illustrated by dash-dot lines in figure 1). This is well below the percentage of women in the field, which has grown from 20% to 30% over the same time range.



**Figure 1:** The percentage of women on spacecraft science teams as a function of time, after figure 1 in [1]. The symbols indicate the destination of the NASA missions. The red stars are for ESA missions.

## 5. Conclusions & Future work

Figure 1 also includes the percentage of women Co-Is on ESA missions to compare to the percentage on NASA missions. The ESA data are consistent with the NASA data, including the jump around the year 2000.

This study wants just to be a first step to promote further discussions within the planetary community. We should consider further ways to create an inclusive workplace for all scientists.

We suggest that all planetary scientists consider the demographic makeup of teams they work with, including mission teams, conference convener groups, panels, etc. If the group is all or predominantly male, the group should work to increase their networking size and add women to the group.

## References

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