Community Atlas of Stellar Streams

```
begin
    using Pkg; Pkg.activate("../")
    using IntrospectiveStreams
    using CSV
    using DataFrames
    using CairoMakie
end
```

```
  Activating project at `~/.julia/dev/IntrospectiveStreams`
WARNING: AstropyDeprecationWarning: The matrix_product function is deprecated
and may be removed in a future version.
        Use @ instead. [gala.coordinates.sgr]
WARNING: AstropyDeprecationWarning: The matrix_product function is deprecated
and may be removed in a future version.
        Use @ instead. [gala.coordinates.orphan]
WARNING: AstropyDeprecationWarning: The matrix_product function is deprecated
and may be removed in a future version.
        Use @ instead. [gala.coordinates.magellanic_stream]
WARNING: AstropyDeprecationWarning: http://bugs.python.org/issue12166 is resol
ved. See docstring for alternatives. [gala.dynamics.core]
```

```
true
```

```
Makie.inline!(true)
```

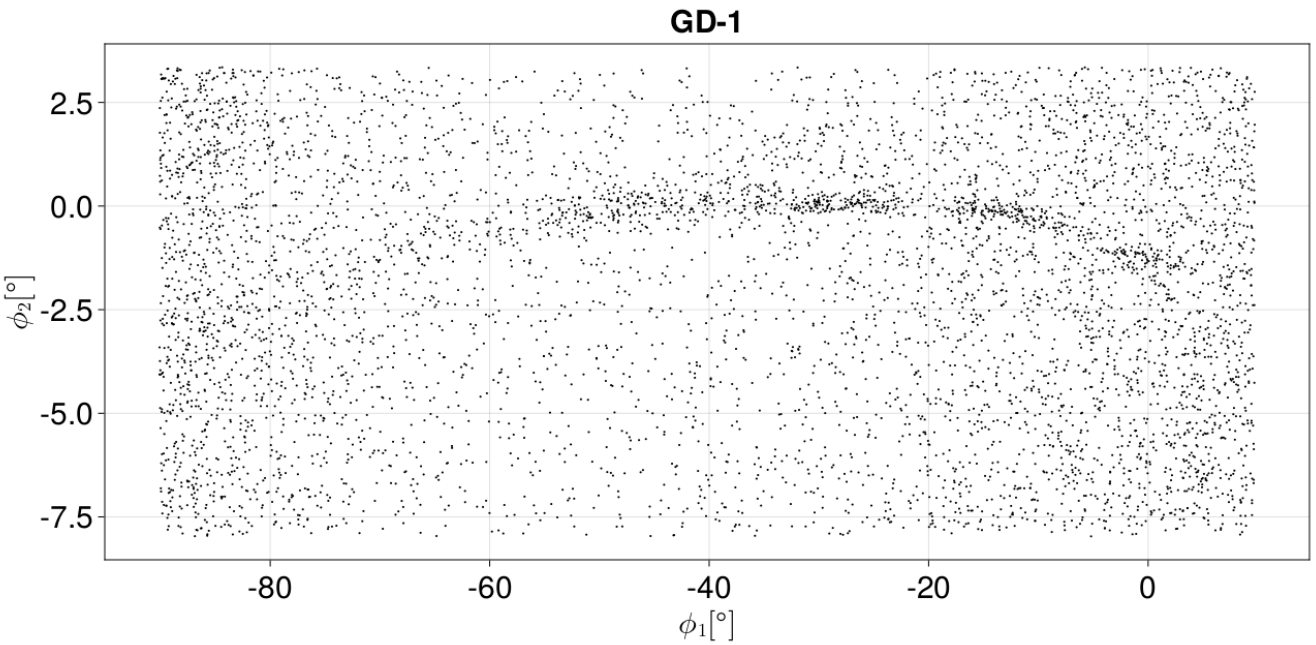
Searching the streams at first order

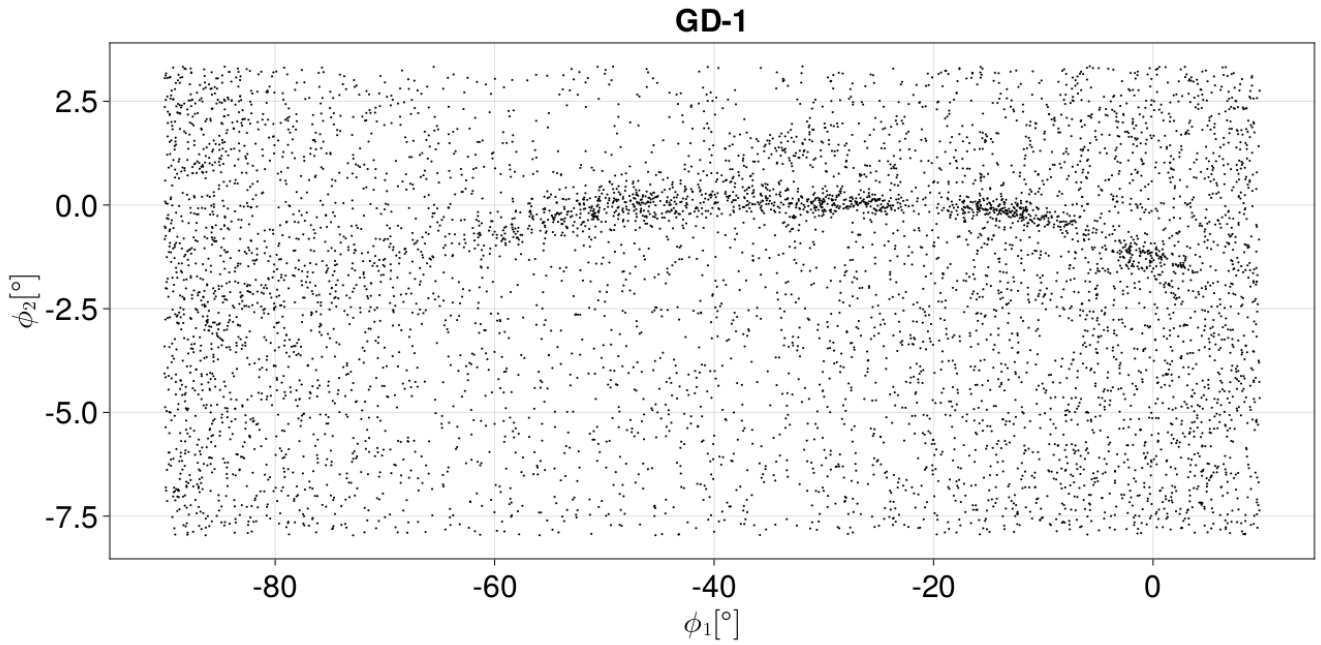
Here we show the result of making approximate cuts in proper motion (PM) and color-magnitude (CM) for the five streams using Gaia DR3. We also show the case of GD-1 with DR2 for comparison. The PM cut is guided by the Galstream track: $\mu^{(t)}$. The filtering is done by keeping only stars that satify: $\forall \phi_1 : |\mu_1^{(\star)} - \mu_1^{(t)}(\phi_1^{(\star)})| < 0.7$ and $\forall \phi_1 : |\mu_2^{(\star)} - \mu_2^{(t)}(\phi_1^{(\star)})| < 0.7$ where $\mu_{1,2}$ are the PMs not corrected by the solar reflex-motion, and $\star$ denotes the Gaia data. The process is performed by the function "example" given below. There you can see the input parameters used for age, metal, σ_c (width in color) and σ (width in PM).

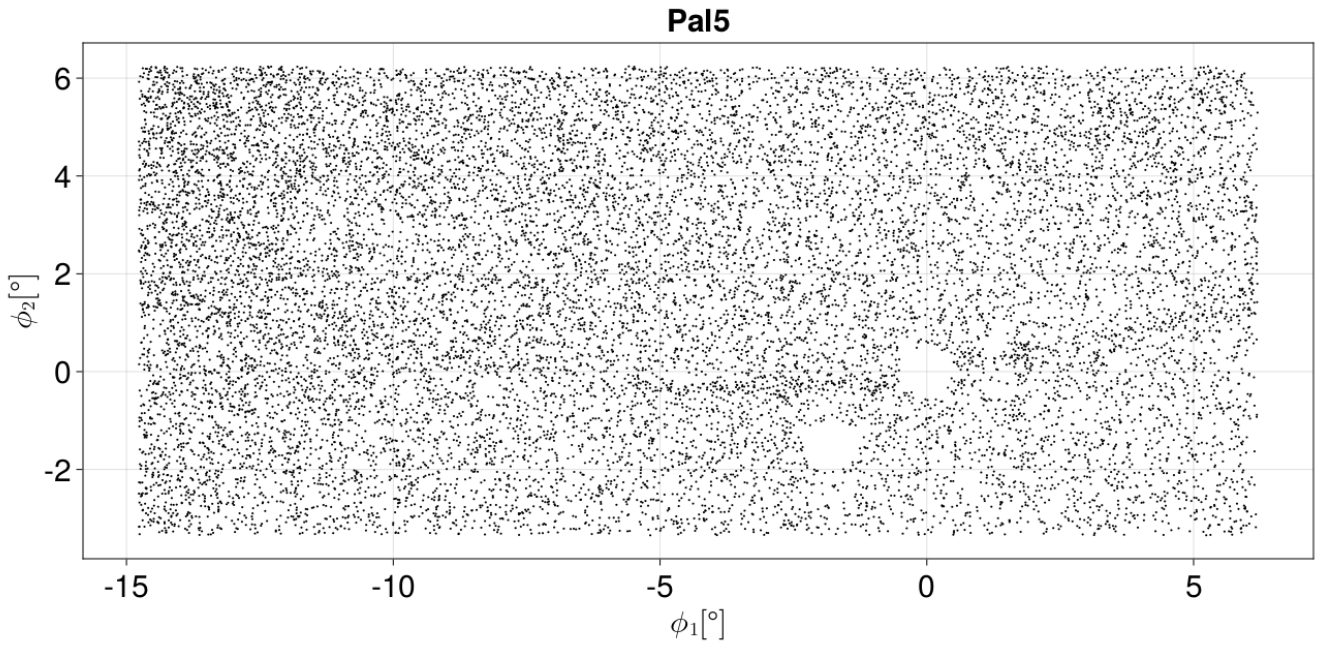
```
begin
    name_s = ["GD-1", "GD-1", "Pal5", "Jhelum", "Fjorm-M68","PS1-A"]
    name_t = ["GD-1-PB18", "GD-1-PB18", "Pal5-PW19", "Jhelum-b-B19", "M68-P19",
"PS1-A-B16"]
    age    = [12.0, 12.0, 12.0, 12.0 ,11.2, 12.0]*10^9 #yr
    metal  = [-1.5, -1.5, -1.4, -1.2, -2.2, -1.7]
    filters = fill("UBVRIplus",length(name_s))
    dr     = fill("DR3",length(name_s))
    dr[1] = "DR2"
    tol_curation = [0.3, 0.3, 1.0]  # tolerances in μ_α*cosδ, μ_δ, Π.
    col_bounds = (-1.0, 4.0)
    box_μ = [[-14,-10.],[-4.,-2.]]
    σ_c = 1
    σ = 0.7

    file_orig, file_corr, file_phot, file_iso, file_filt, file_plot  =
name_files_all(dr, name_s, age, metal)
    nothing
end
```

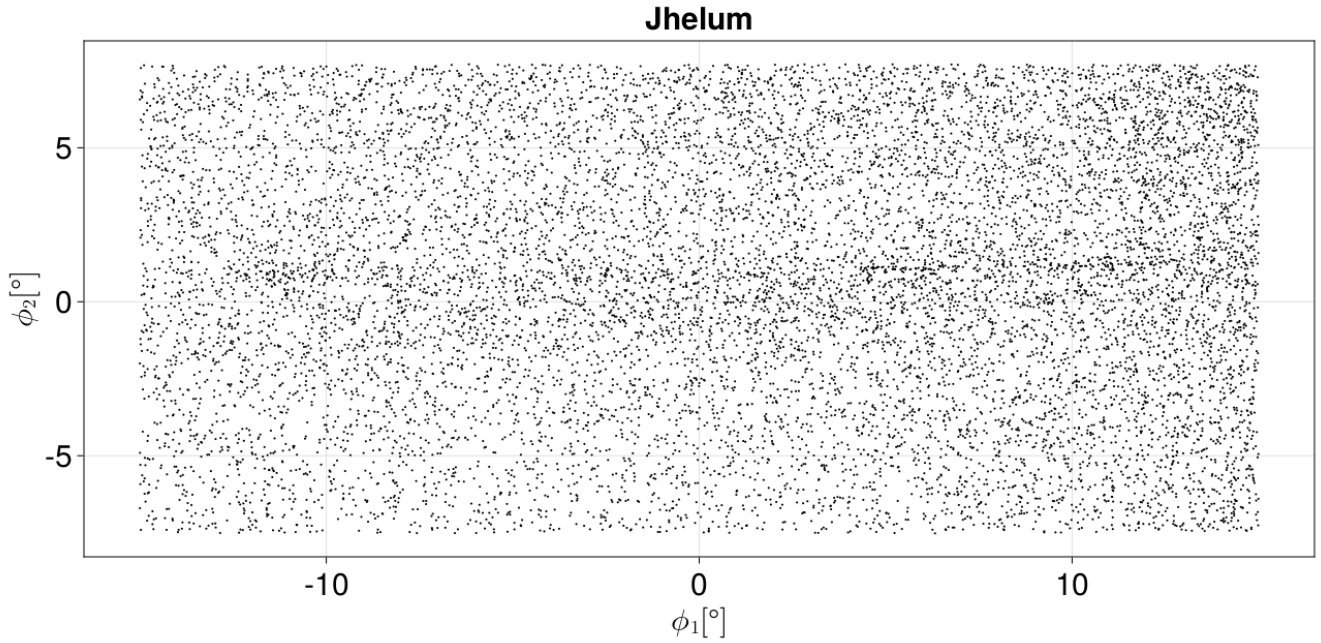
Now lets reopen the filtered files and display the plots without the tracks so as not to cheat the eye.

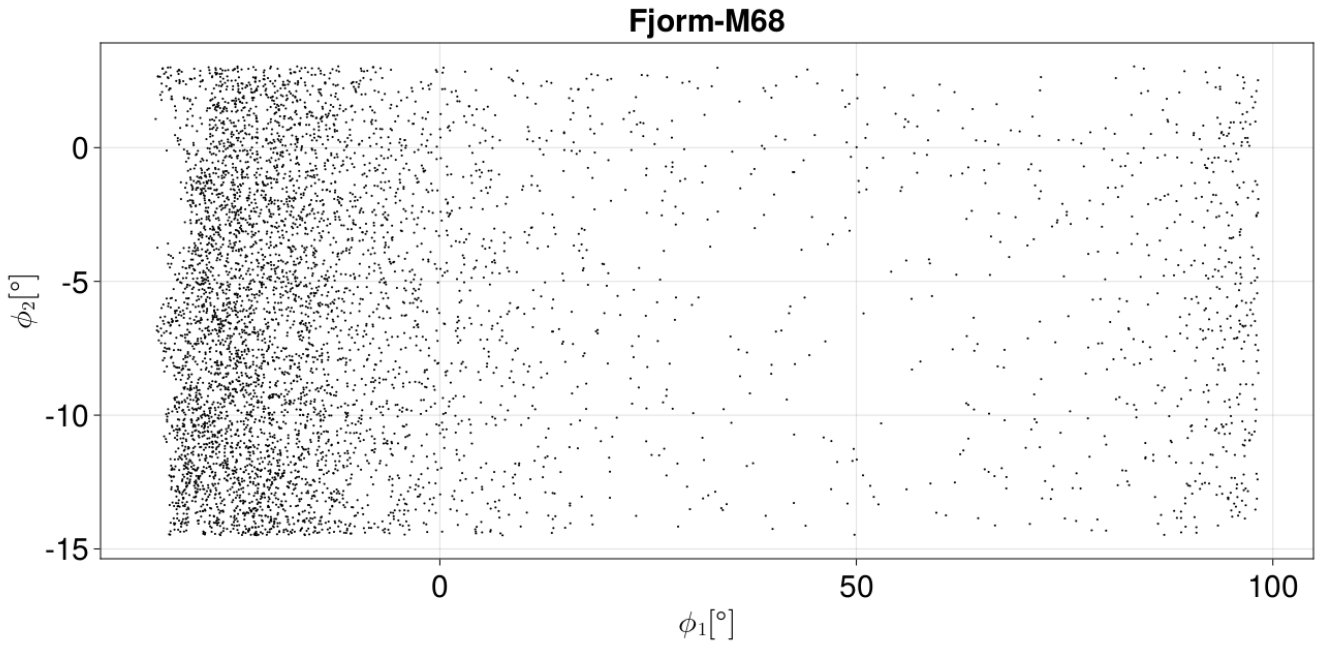
```
begin
    figs = Vector{Figure}(undef, length(name_s))
    for i ∈ eachindex(name_s)
        df = DataFrame(CSV.File(file_filt[i], delim=",", ignorerepeated=true))
        figs[i]=plot_scatter_on_sky_self_frame(name_s[i], df, file_plot[i])
    end
end
```

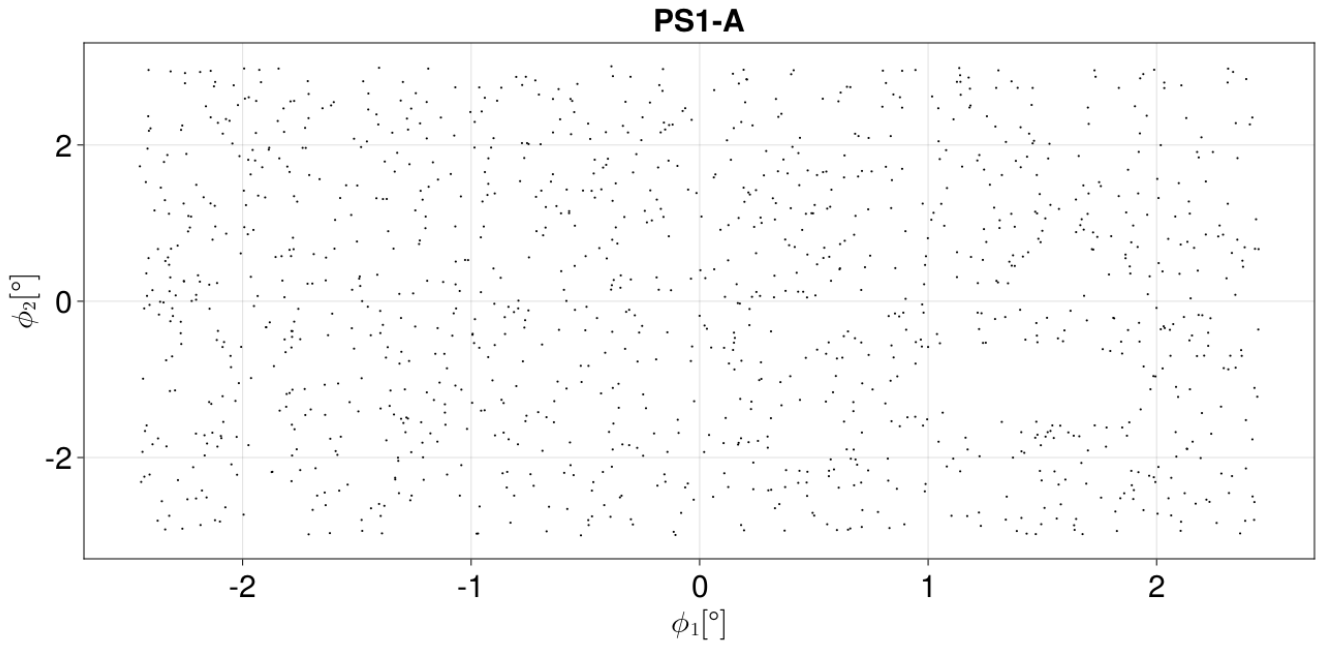



GD-1
2.5
0.0
-2.5
-5.0
-7.5
ϕ_2[°]
-80
-60
-40
-20
0
ϕ_1[°]


Pal5
6
4
2
0
-2
ϕ_2[°]
-15
-10
-5
0
5
ϕ_1[°]


Jhelum
5
0
-5
ϕ_2[°]
-10
0
10
ϕ_1[°]

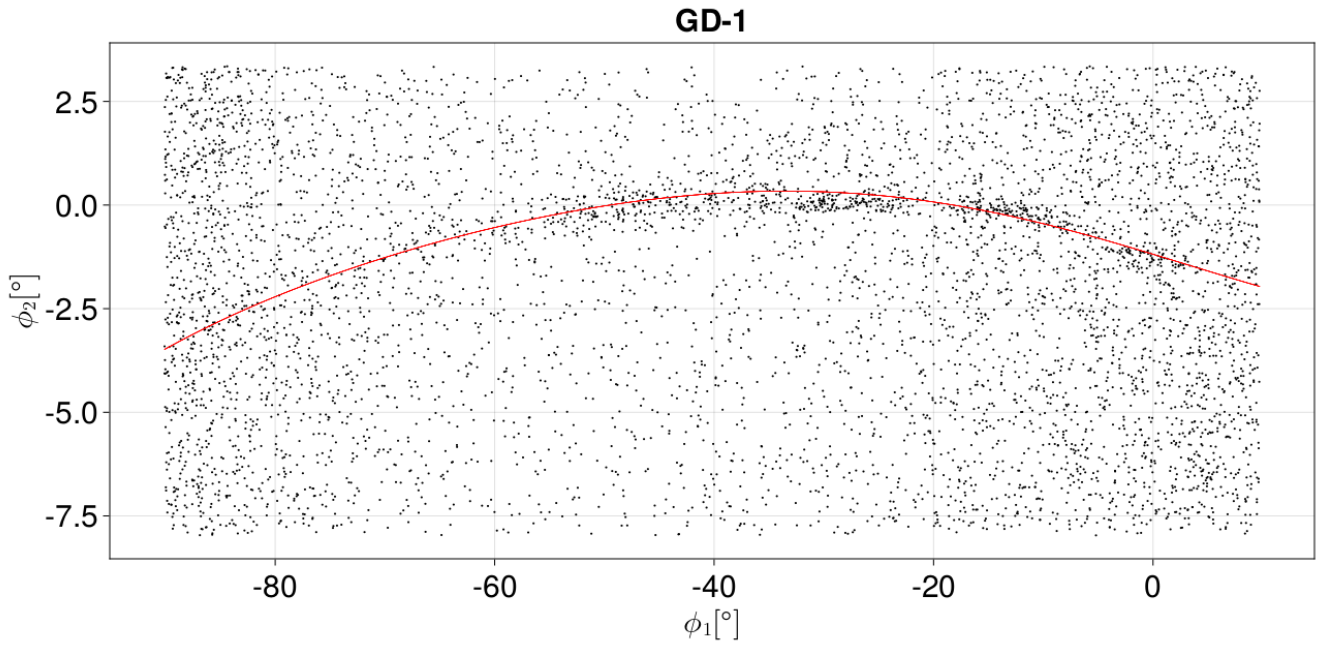

Fjorm-M68
0
-5
-10
-15
ϕ_2[°]
0
50
100
ϕ_1[°]

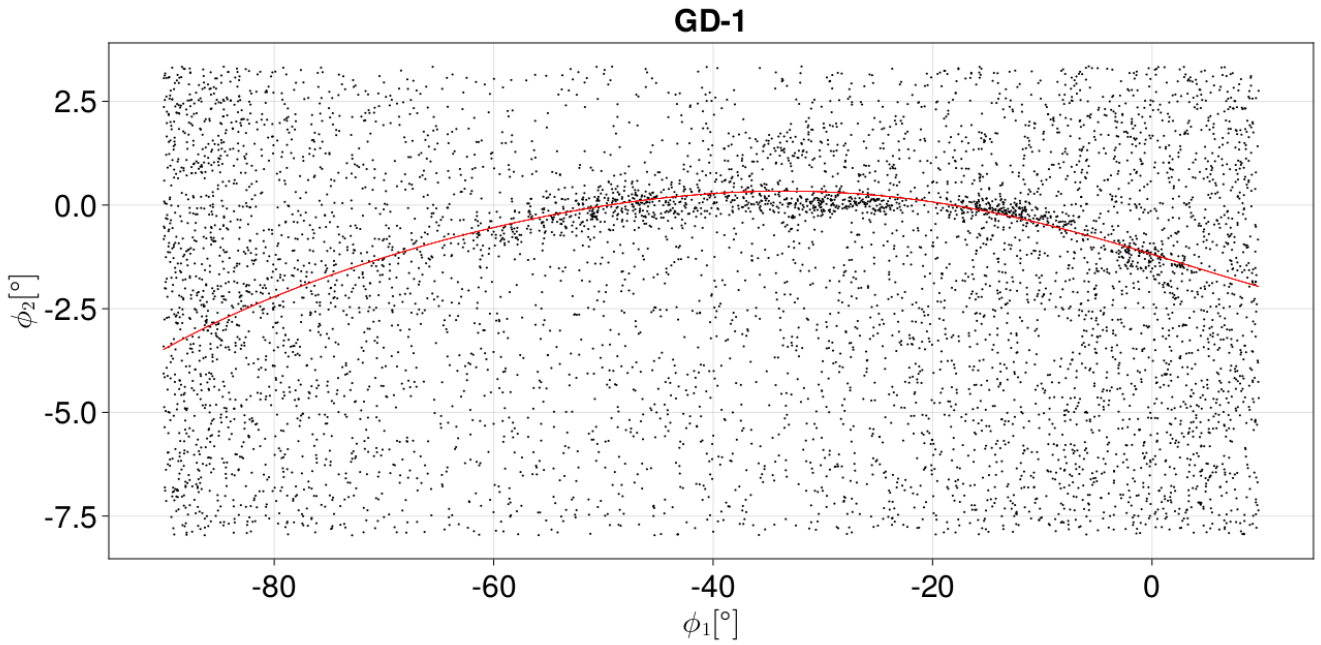

PS1-A
2
0
-2
ϕ_2[°]
-2
-1
0
1
2
ϕ_1[°]

```
begin
    figs_t = Vector{Figure}(undef, length(name_s))
    for i ∈ eachindex(name_s)
        df = DataFrame(CSV.File(file_filt[i], delim=",", ignorerepeated=true))
        df_track, self_frame = load_stream_track(name_t[i])
        figs_t[i]=plot_scatter_on_sky_self_frame(name_s[i], df, df_track,
        file_plot[i])
    end
end
```

```
WARNING: AstropyDeprecationWarning: The matrix_product function is deprecat
ed and may be removed in a future version.
        Use @ instead. [gala.coordinates.greatcircle]
WARNING: AstropyDeprecationWarning: The matrix_product function is deprecated
and may be removed in a future version.
        Use @ instead. [gala.coordinates.greatcircle]
WARNING: AstropyDeprecationWarning: The matrix_product function is deprecated
and may be removed in a future version.
        Use @ instead. [gala.coordinates.greatcircle]
WARNING: AstropyDeprecationWarning: The matrix_product function is deprecated
and may be removed in a future version.
        Use @ instead. [gala.coordinates.greatcircle]
WARNING: AstropyDeprecationWarning: The matrix_product function is deprecated
and may be removed in a future version.
        Use @ instead. [gala.coordinates.greatcircle]
WARNING: AstropyDeprecationWarning: The matrix_product function is deprecated
and may be removed in a future version.
        Use @ instead. [gala.coordinates.greatcircle]
WARNING: AstropyDeprecationWarning: The matrix_product function is deprecated
and may be removed in a future version.
        Use @ instead. [gala.coordinates.greatcircle]
WARNING: AstropyDeprecationWarning: The matrix_product function is deprecated
and may be removed in a future version.
        Use @ instead. [gala.coordinates.greatcircle]
WARNING: AstropyDeprecationWarning: The matrix_product function is deprecated
and may be removed in a future version.
        Use @ instead. [gala.coordinates.greatcircle]
WARNING: AstropyDeprecationWarning: The matrix_product function is deprecated
and may be removed in a future version.
        Use @ instead. [gala.coordinates.greatcircle]
```

Now lets plot together with the tracks.


GD-1
2.5
0.0
-2.5
-5.0
-7.5
ϕ_2[°]
-80
-60
-40
-20
0
ϕ_1[°]


GD-1
2.5
0.0
-2.5
-5.0
-7.5
ϕ_2[°]
-80
-60
-40
-20
0
ϕ_1[°]