# Population reducer

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1 Brief description of the code

The population reducer is meant for separating different populations within velocity distributions from each other. The aim of the code is to provide a way to analyze different populations in a robust way. For example, it might be important for the user to be able to separate backstreaming populations from core maxwellian populations.

2 Algorithm employed

2.1 Short description

The algorithm relies on locating *local maximas* within the velocity distributions. The idea is that we assume each velocity population has a local maximum somewhere, and that different populations are connected by a local minimum:
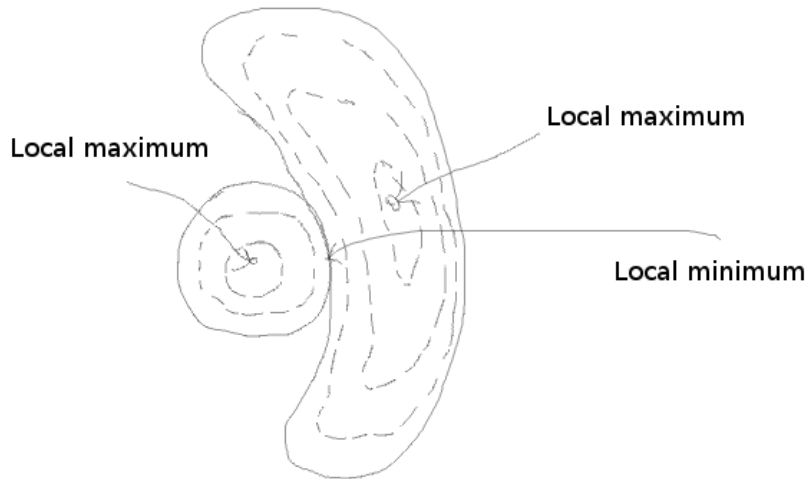
In this case we can assume that by iterating through velocity space starting from the largest value and moving to the next-largest value on every iteration,

we finally hit the local minimum shown in Figure **??**, and get two separate populations.

2.2 Pseudocode

Algorithm 1 Population algorithm

1: **function** POPULATION_REDUCER(*cell*, tolerance)
2:     $vcells \leftarrow get\_velocity\_cells(cell)$
3:     $sort(vcells)$ based on their value
4:     Let *populations* be all populations
5:     **for** all velocity cells *vcell* in *vcells* **do**
6:         **if** *vcell* neighbor of any *population* in *populations* **then**
7:             **if** *vcell* neighbor of one *population* **then**
8:                 $population \leftarrow vcell$
9:             **else if** *vcell* neighbor of more than one *population* in *populations* **then**
10:                 Let the populations be *population*1, *population*2
11:                 **if** *population*1 or *population*2 small **then**
12:                     $Merge(population1, population2)$
13:                 **else**
14:                     $population1 \leftarrow vcell$
15:                 **end if**
16:             **end if**
17:         **else**
18:             $population \leftarrow new\_population()$
19:             $population \leftarrow vcell$
20:             $populations \leftarrow population$
21:         **end if**
22:     **end for**
23: **end function**