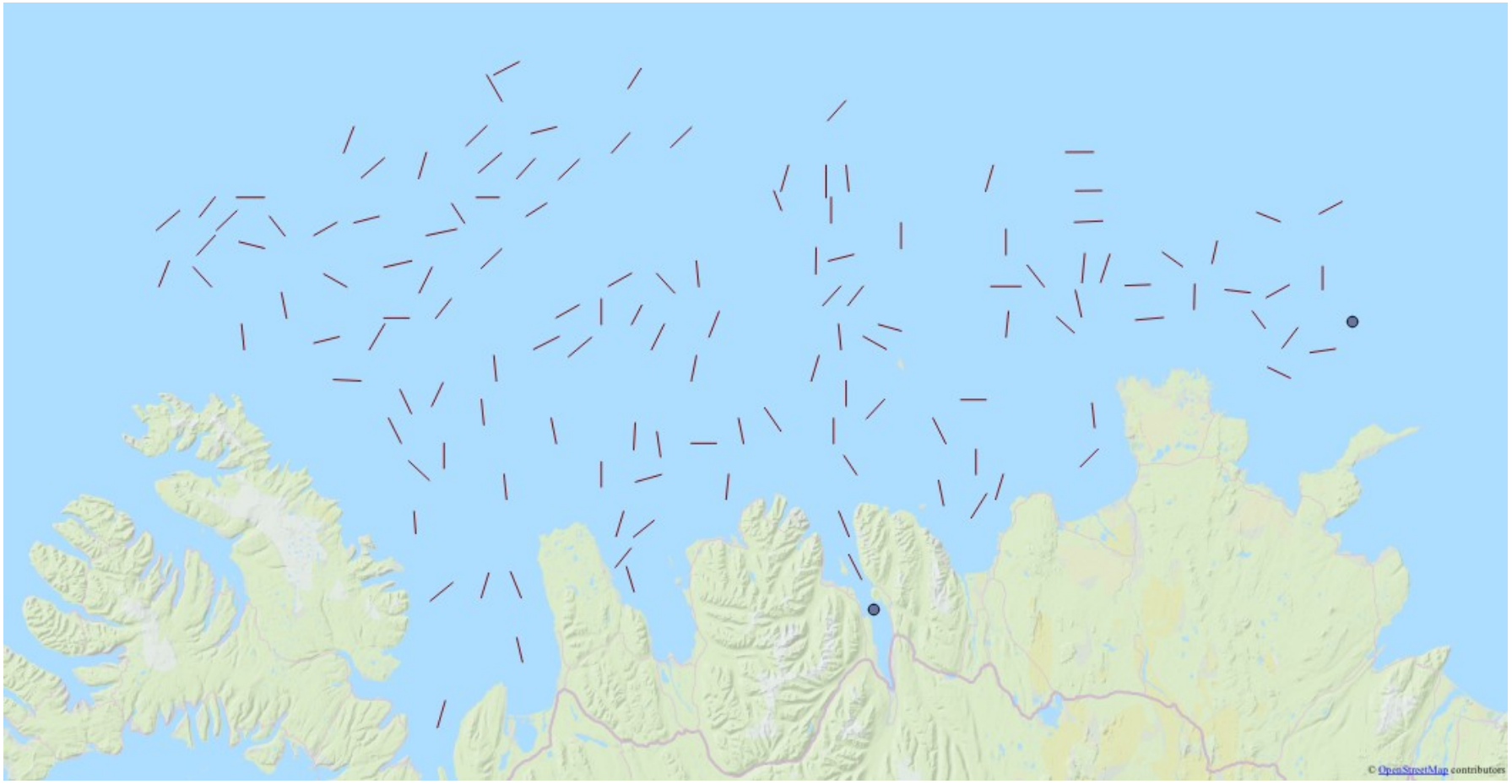
VEL 113F Final Project

Luke Peterson

Traveling Salesman Problem



Objective

"Shortest path"

- Include current
- Include landmass
- Does not include wind
- Does not include slower travel during trawling
- Assumes points on flat coordinate plane

Actual PI is only useful for comparison

Ocean Currents

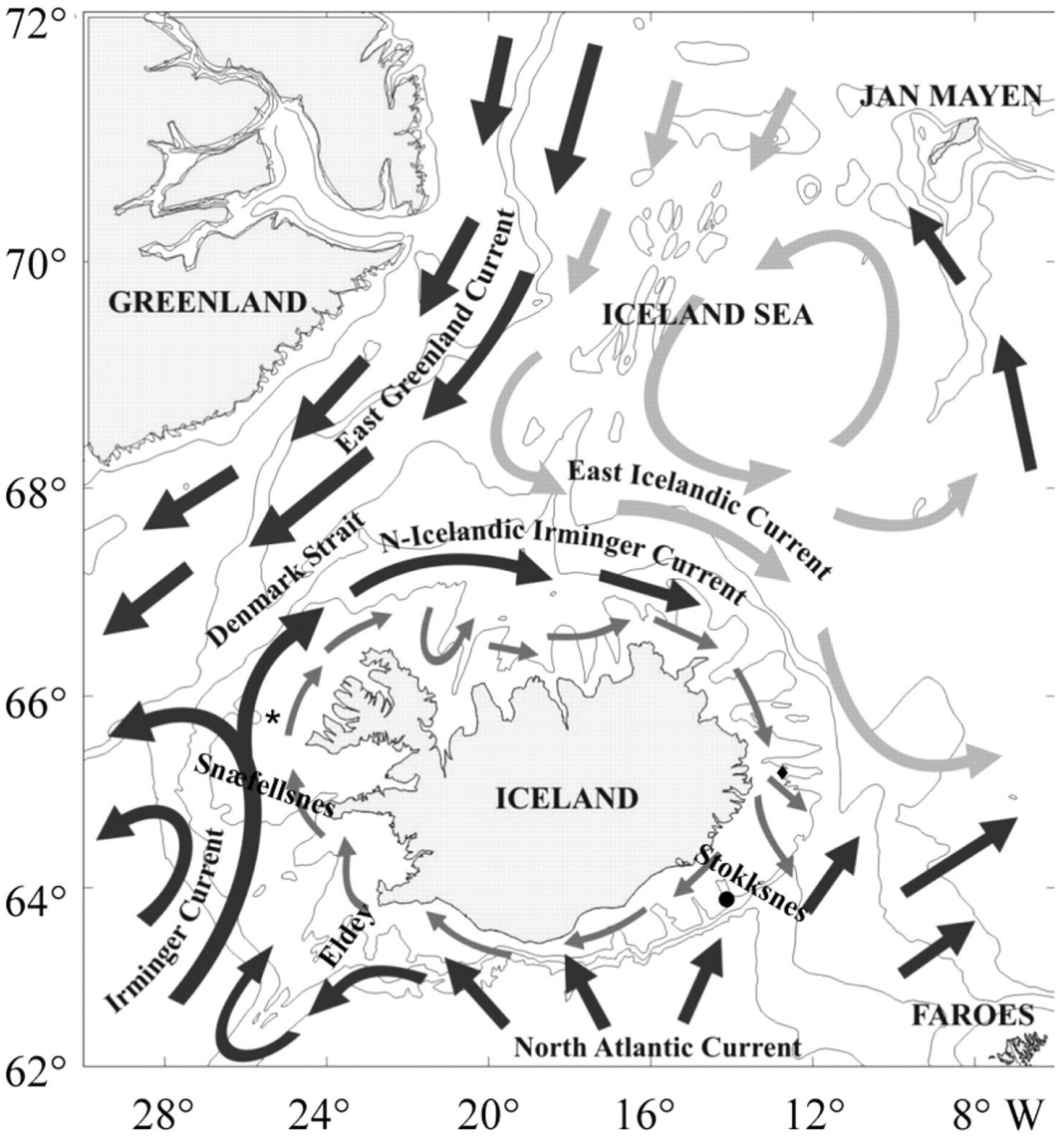
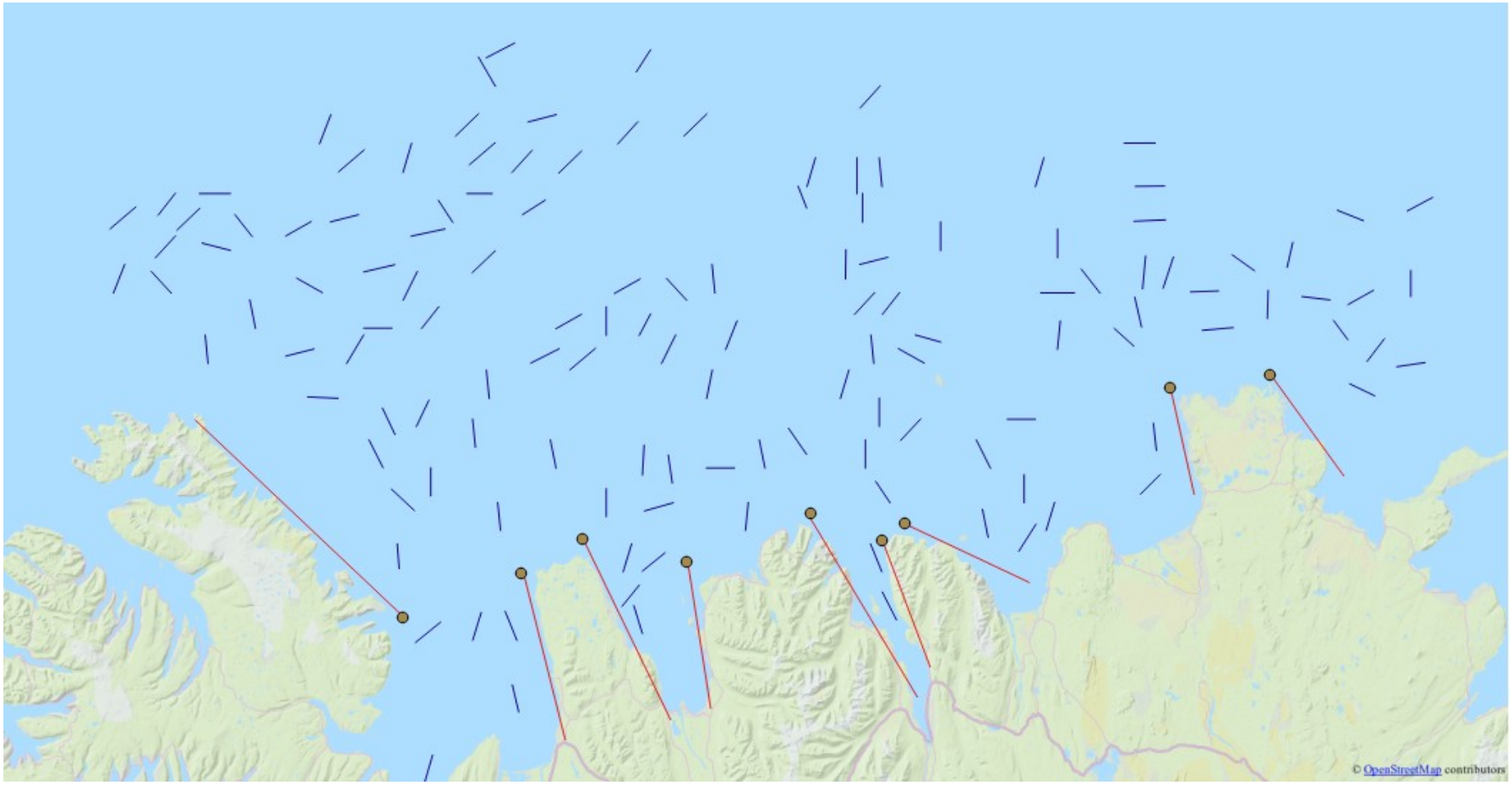
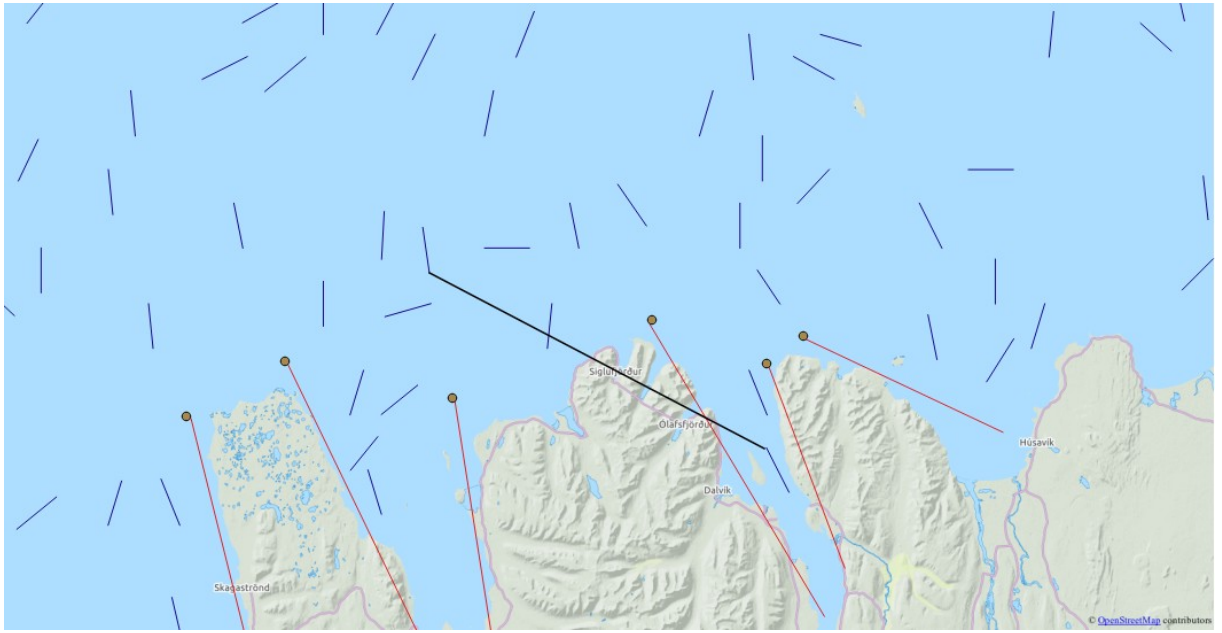


Image credit Marine Research Institute

Land



Land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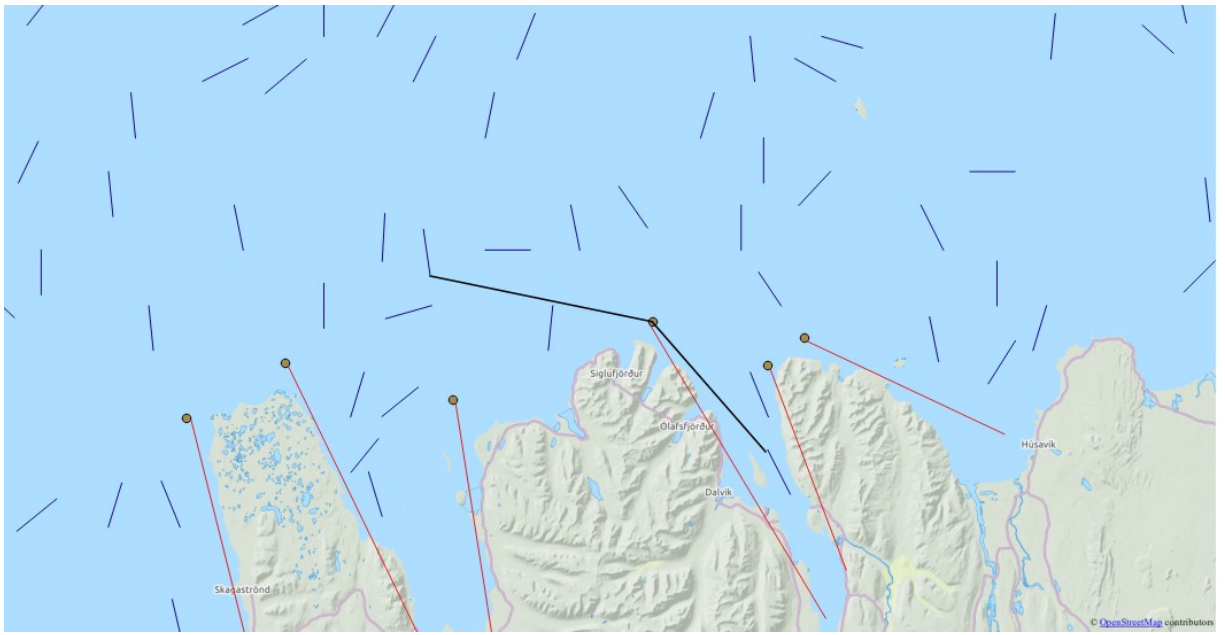
Siglufjörður
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Calculating Distance

```
def dist(x1,y1,x2,y2):
    for i in intLines:
        if linesIntersect(i,[x1,y1,x2,y2]):
            return dist(x1,y1,i[0],i[1]) + dist(i[0],i[1],x2,y2)
            break
        else:
            if x1 > x2: # traveling west, apply 5% penalty in the x direction
                return np.sqrt( (((x2-x1)*1.05)**2) + (y2-y1)**2 )
            else:
                return np.sqrt( (x2-x1)**2 + (y2-y1)**2 )
```

Calculating Intersection

```
def linesIntersect(l1,l2):
    # calculate orientation of lines
     a = np.array([l1[0], l1[1]])
     b = np.array([l1[2], l1[3]])
     c = np.array([l2[0], l2[1]])
     d = np.array([l2[2], l2[3]])
     if (np.cross(b-a,c-b) * np.cross(b-a,d-b) < 0) and
        (np.cross(d-c,a-d) * np.cross(d-c,b-d) < 0):
         return True
     else:
         return False
```

Model

132 Integer permutation

Assumptions:

- All vectors are reachable from all others
- No loops will exist
- No interruptions while sailing

Procedure

20000 Generations

20 Pop. Size

Prcro: .8

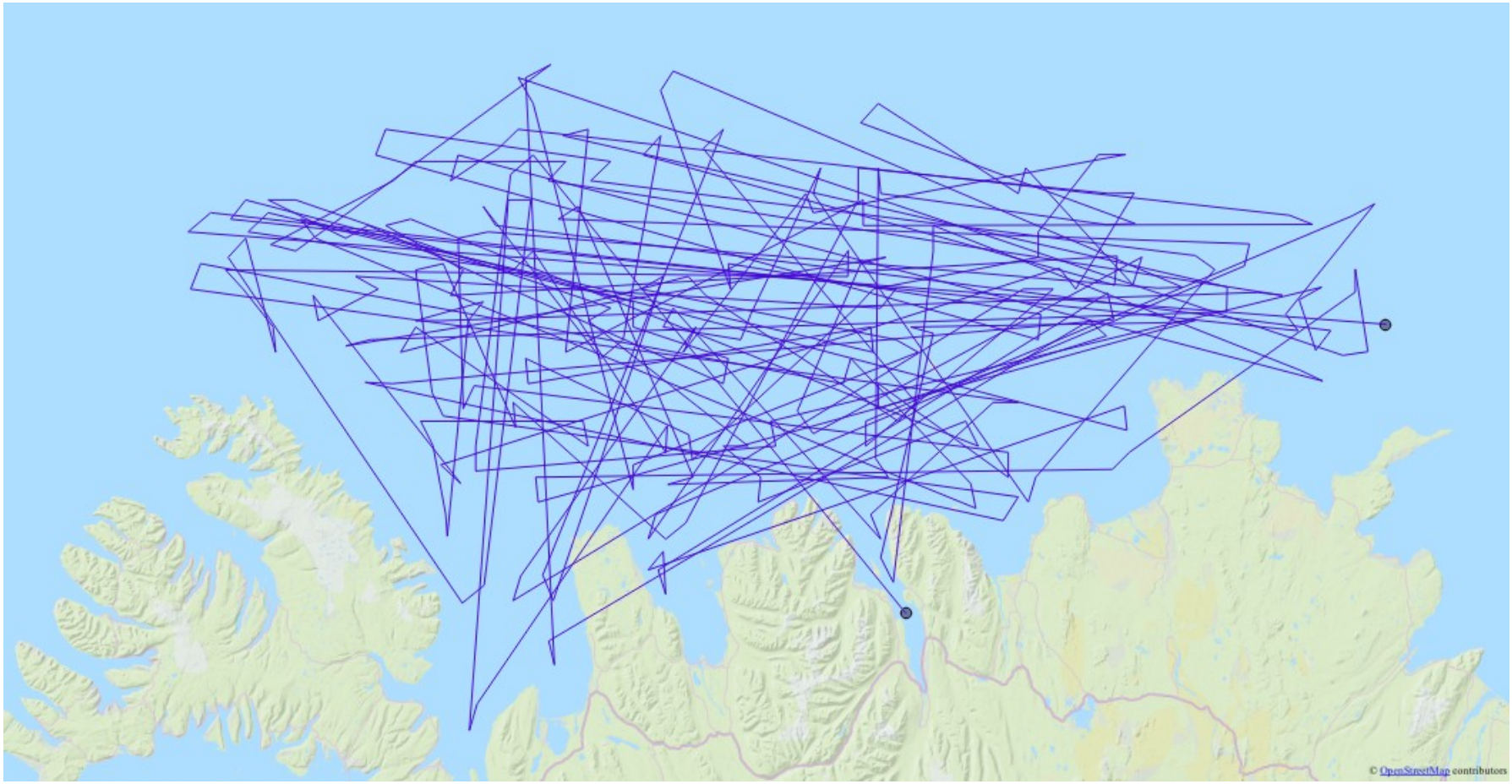
Prmut: .05

Edge Recombination

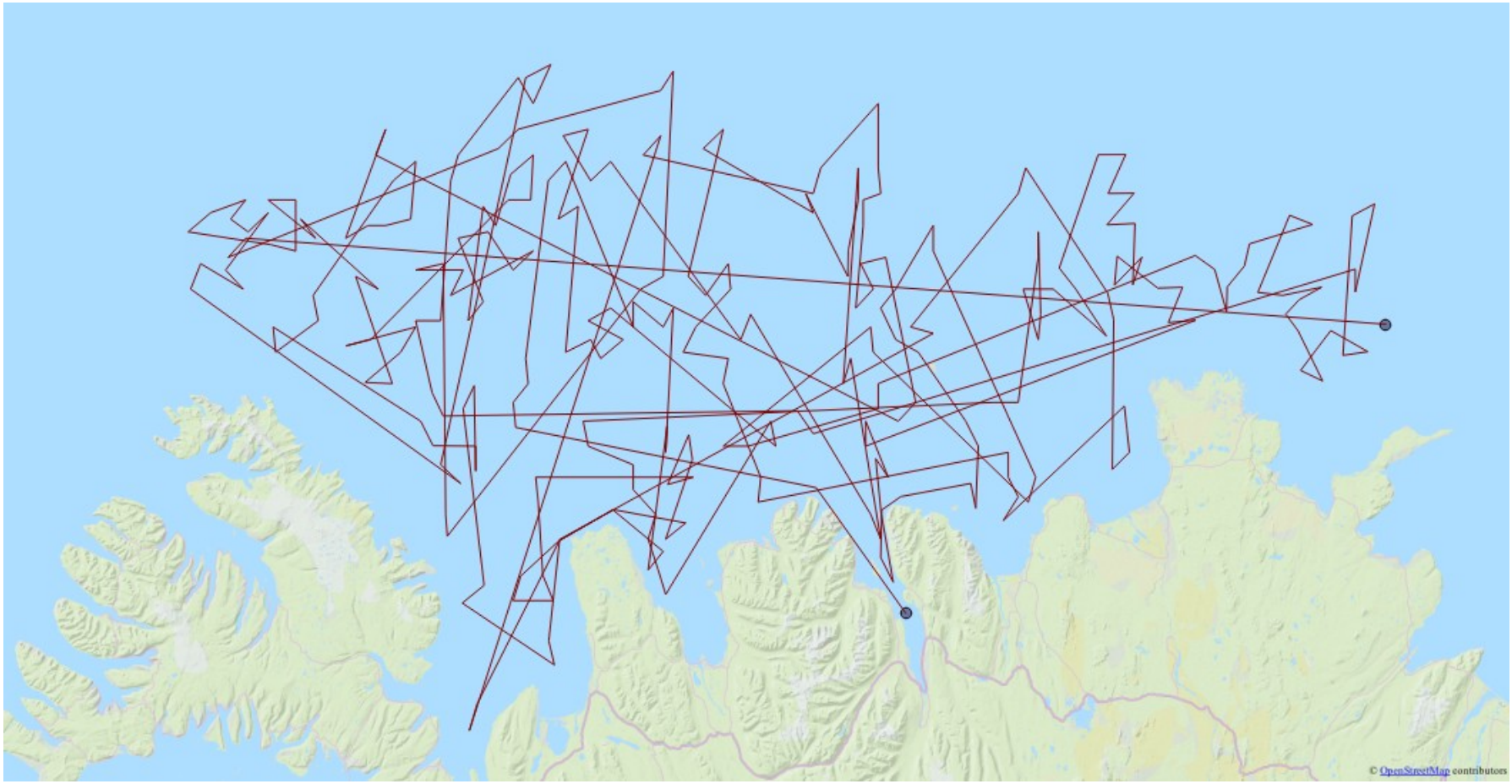
Reciprocal Mutation

Lin-Kernighan Heuristic

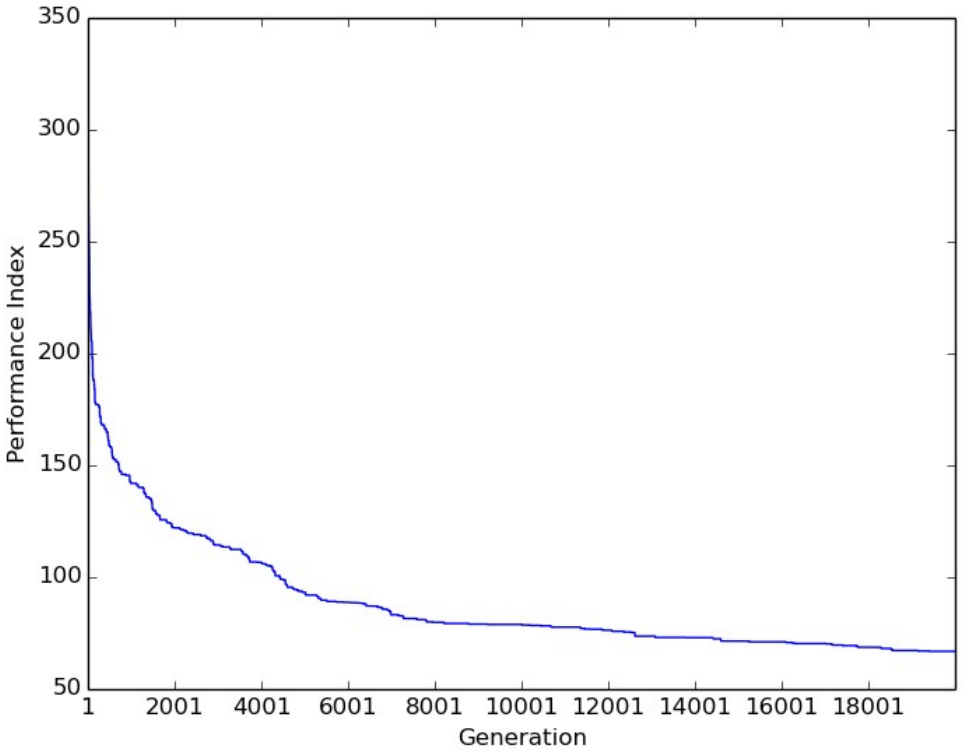
Random



Result



Result



20000 Generations

20 Pop. Size

PI: 66.8

Before LK: 140