

# Localisation and acoustic radiation in complex structures

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Gautier Lefebvre



PHYSICAL REVIEW

VOLUME 109, NUMBER 5

MARCH 1, 1958

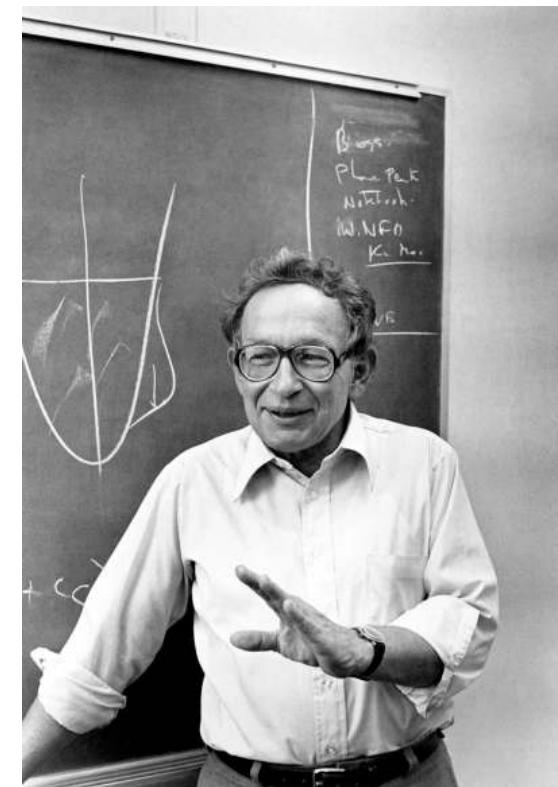
## Absence of Diffusion in Certain Random Lattices

P. W. ANDERSON

*Bell Telephone Laboratories, Murray Hill, New Jersey*

(Received October 10, 1957)

This paper presents a simple model for such processes as spin diffusion or conduction in the "impurity band." These processes involve transport in a lattice which is in some sense random, and in them diffusion is expected to take place via quantum jumps between localized sites. In this simple model the essential randomness is introduced by requiring the energy to vary randomly from site to site. It is shown that at low enough densities no diffusion at all can take place, and the criteria for transport to occur are given.



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**Figure 2.** Filoche and Mayboroda

## Universal mechanism for Anderson and weak localization

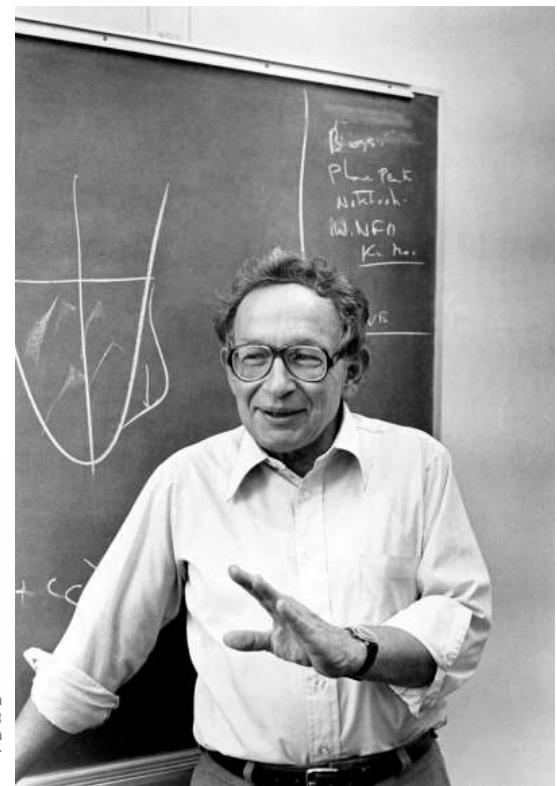
Marcel Filoche<sup>a,b,1</sup> and Svitlana Mayboroda<sup>c</sup>

<sup>a</sup>Physique de la Matière Condensée, Ecole Polytechnique, Centre National de la Recherche Scientifique, 91128 Palaiseau, France; <sup>b</sup>Centre de Mathématiques et de Leurs Applications, Ecole Normale Supérieure de Cachan, Centre National de la Recherche Scientifique, Université Paris-Saclay, 94230 Cachan, France; and <sup>c</sup>School of Mathematics, University of Minnesota, Minneapolis, MN 55455, USA

Edited by Michael Berry, University of Bristol, Bristol, United Kingdom, and approved July 20, 2012 (received for review December 13, 2011)

**Localization of stationary waves occurs in a large variety of vibrating systems, whether mechanical, acoustical, optical, or quantum. It is induced by the presence of an inhomogeneous medium, a complex potential, or a random distribution of scatterers.**

Consider for instance a simple case of Anderson localization illustrated in Fig. 1. The original domain (called  $\Omega$ ) is a unit square. It is divided into  $400 = 20 \times 20$  smaller squares. On each of these smaller squares the potential  $U(x)$  is constant. We take



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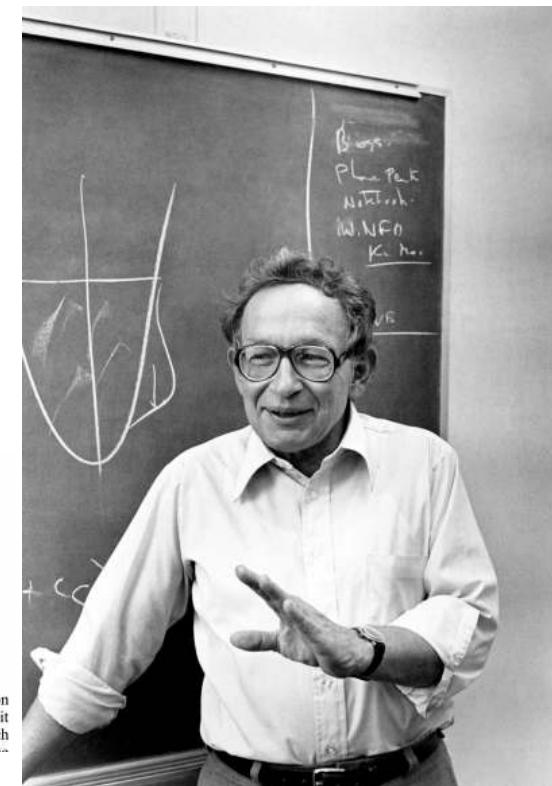
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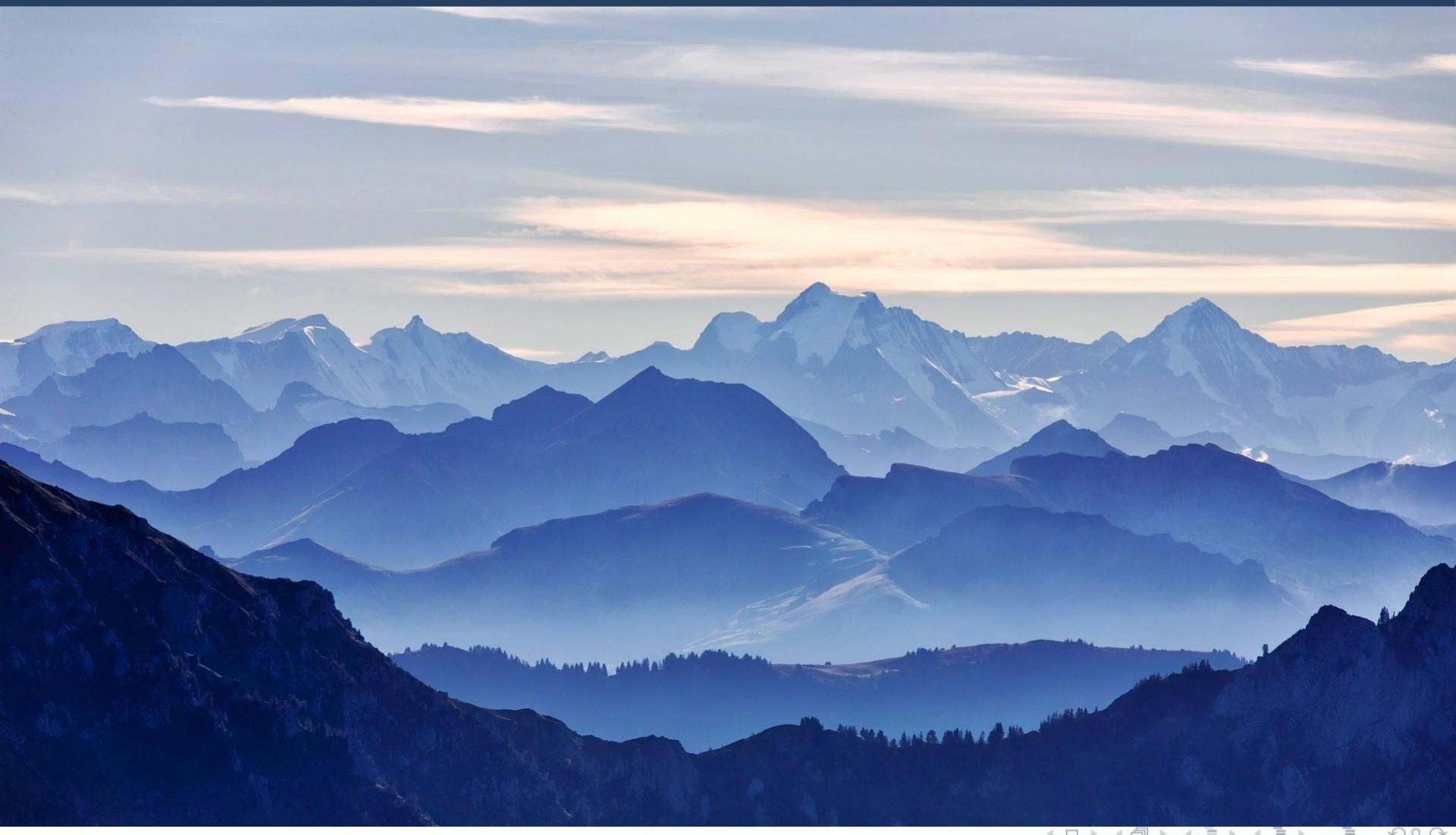
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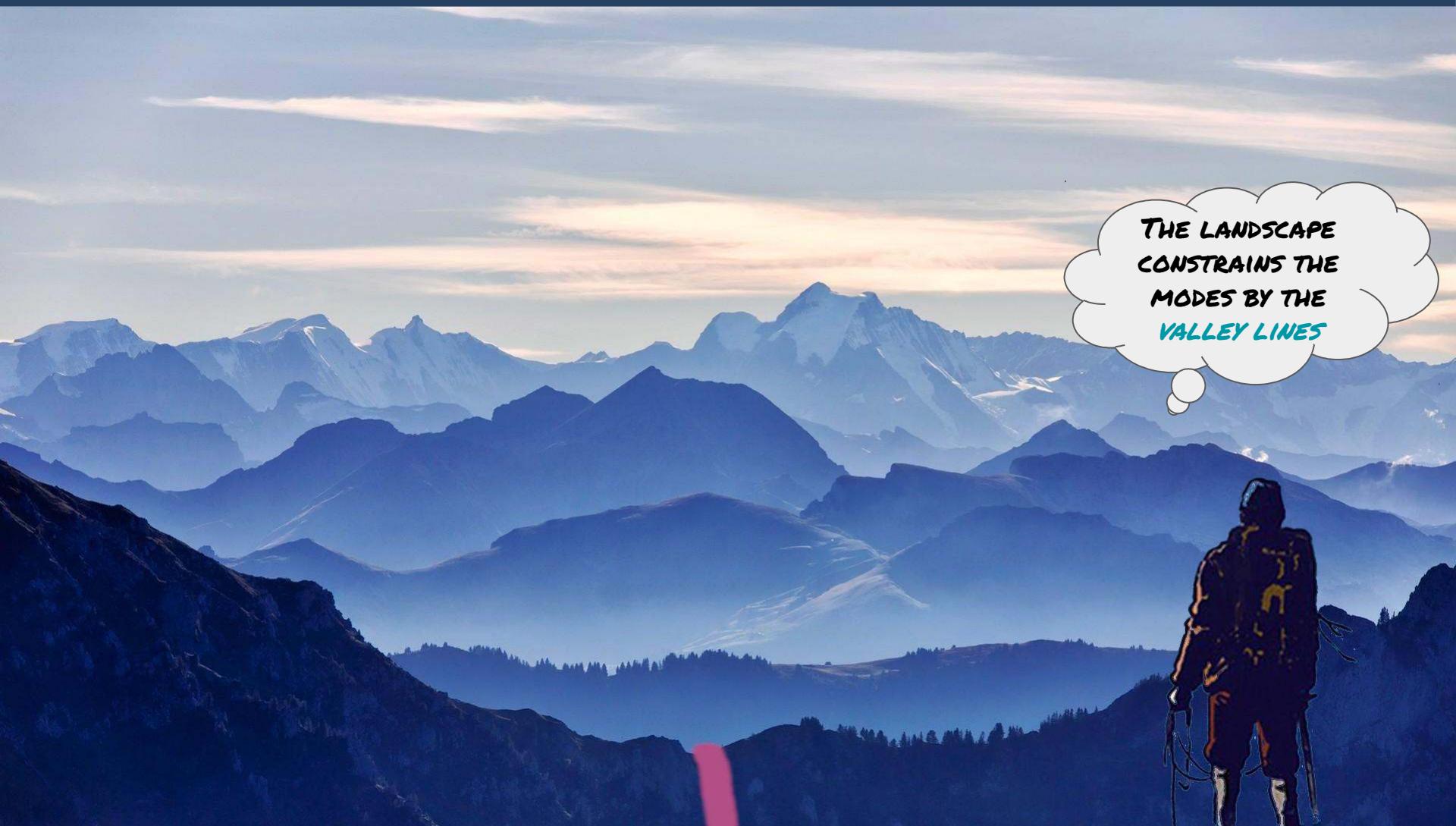
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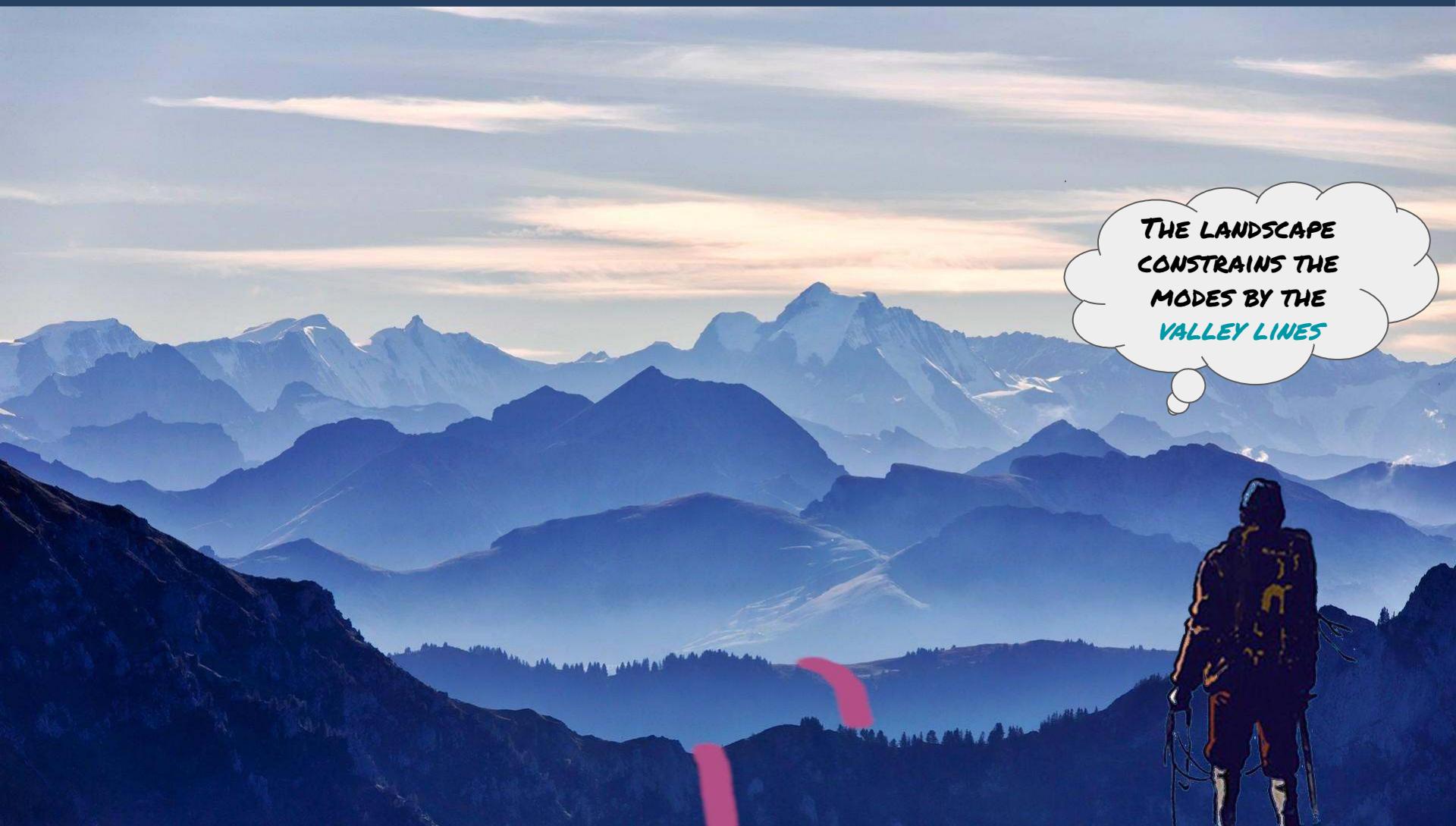
# LANDSCAPE OF LOCALISATION

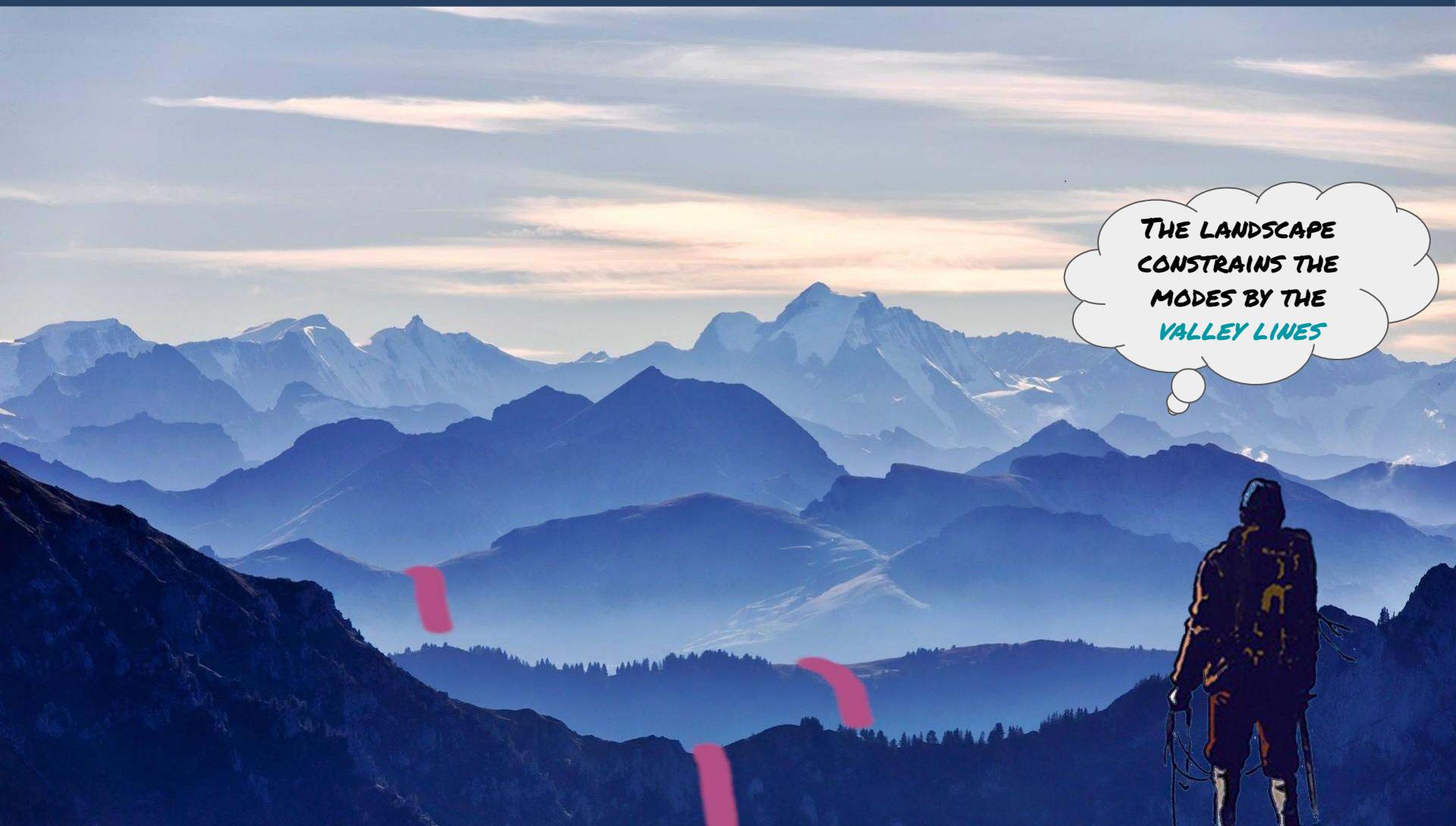


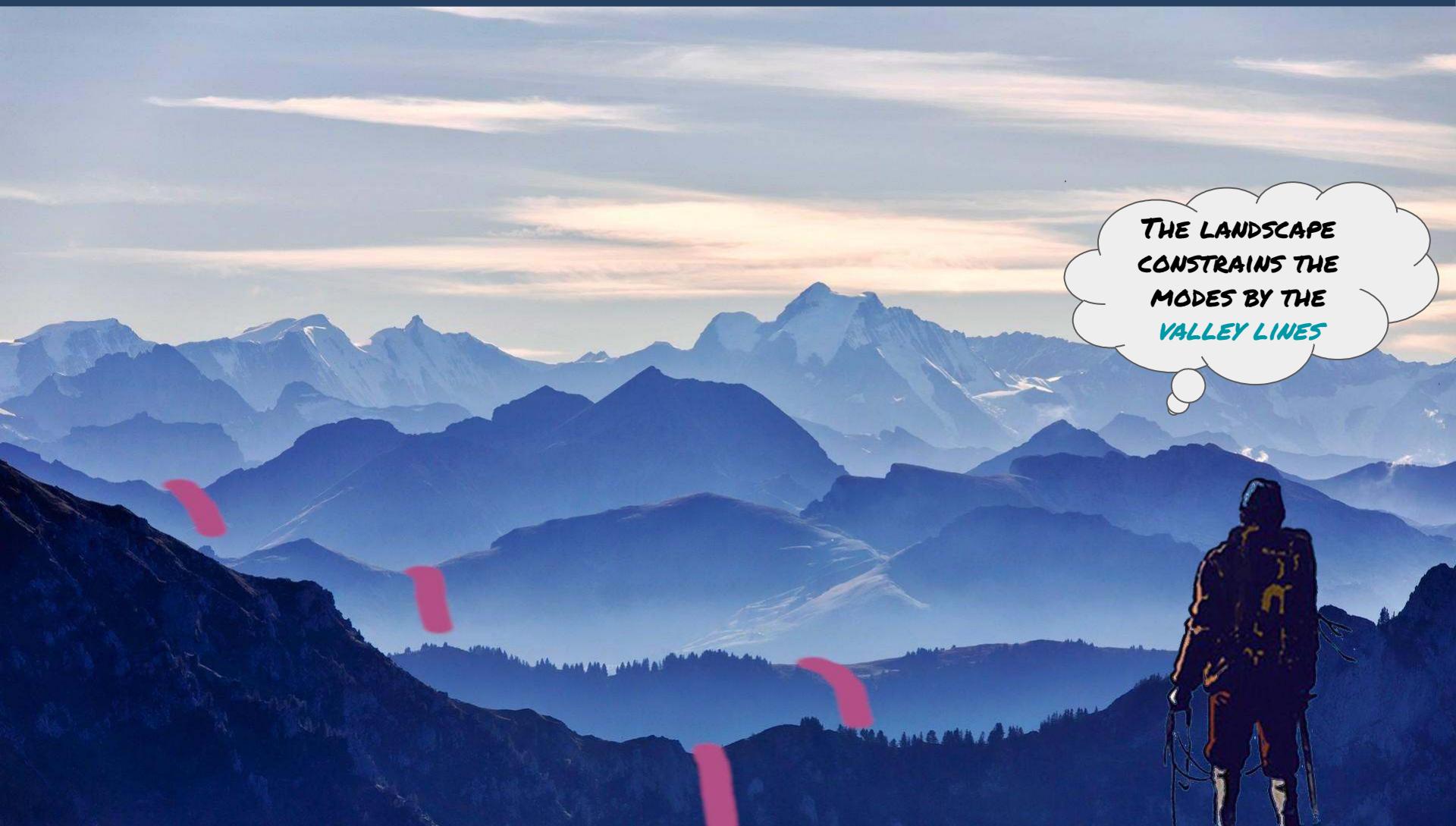


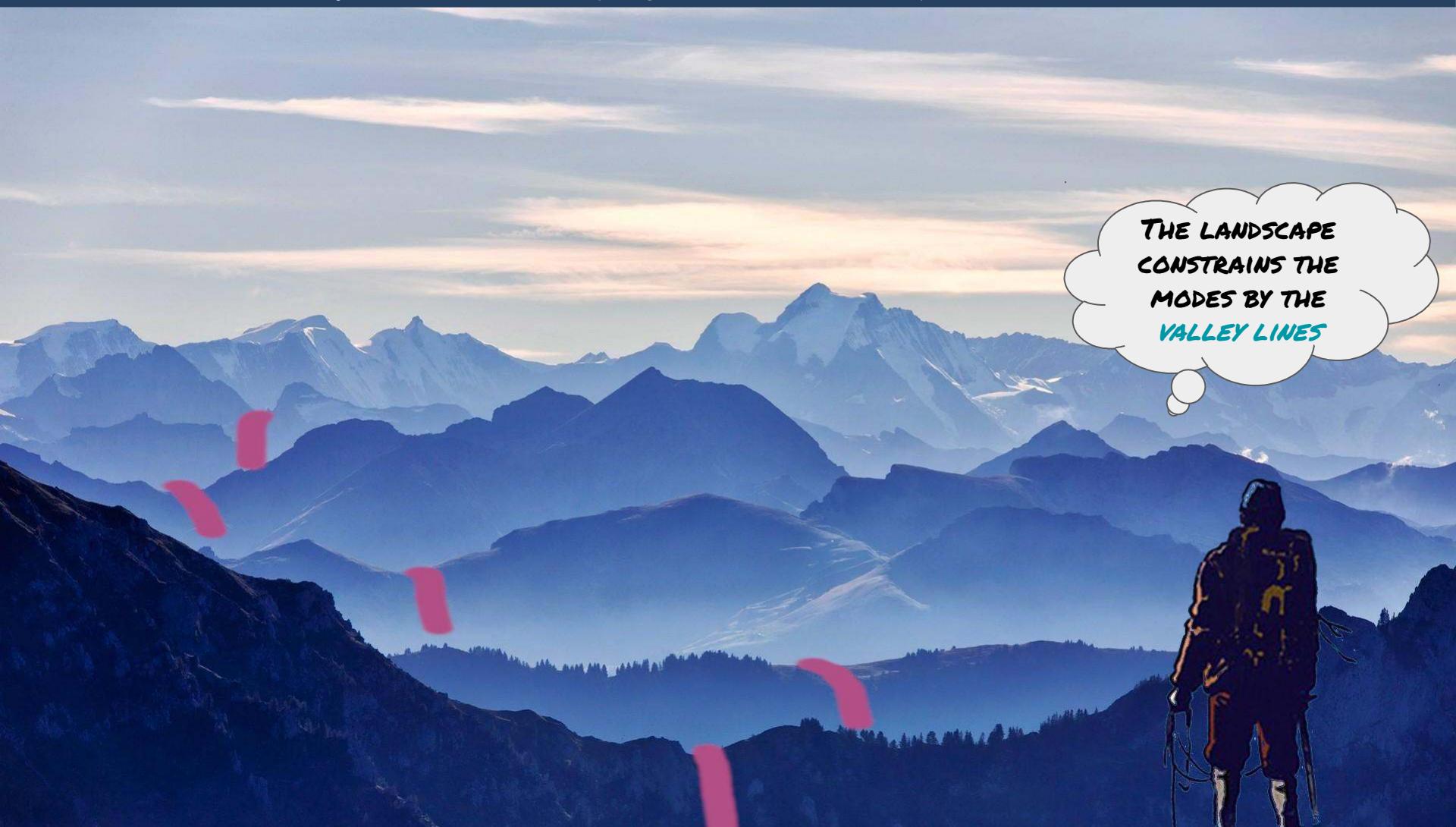


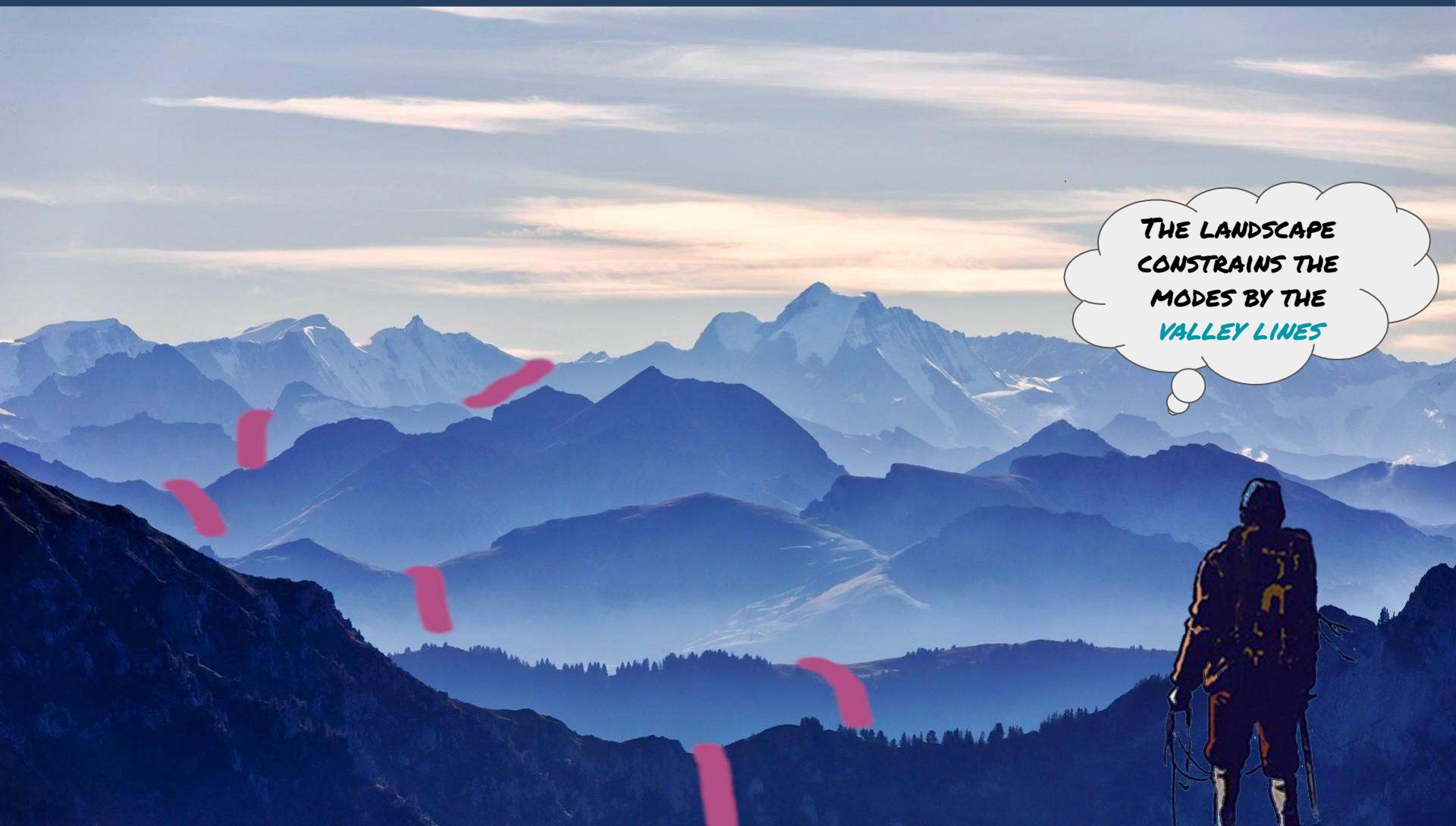


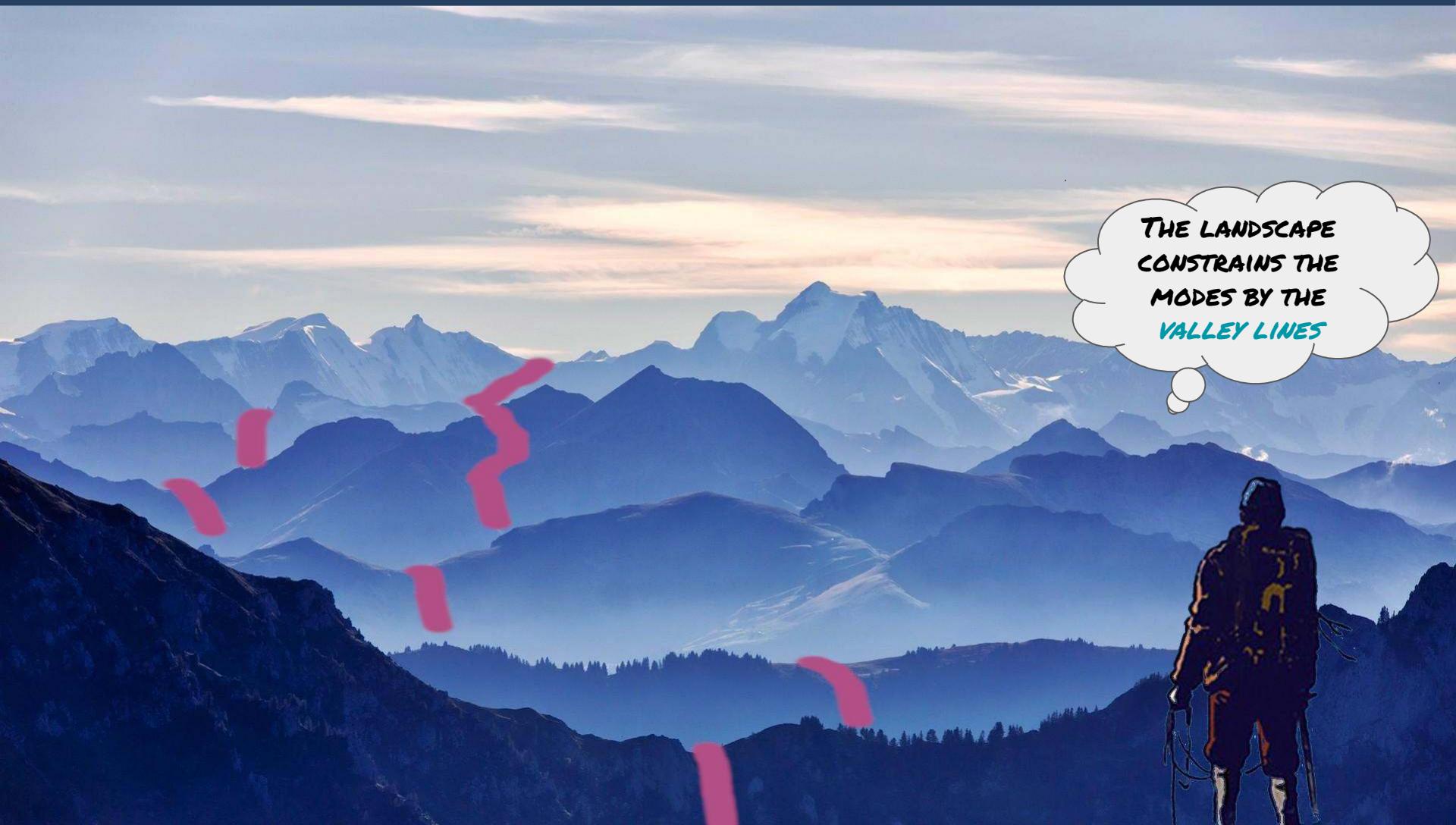






























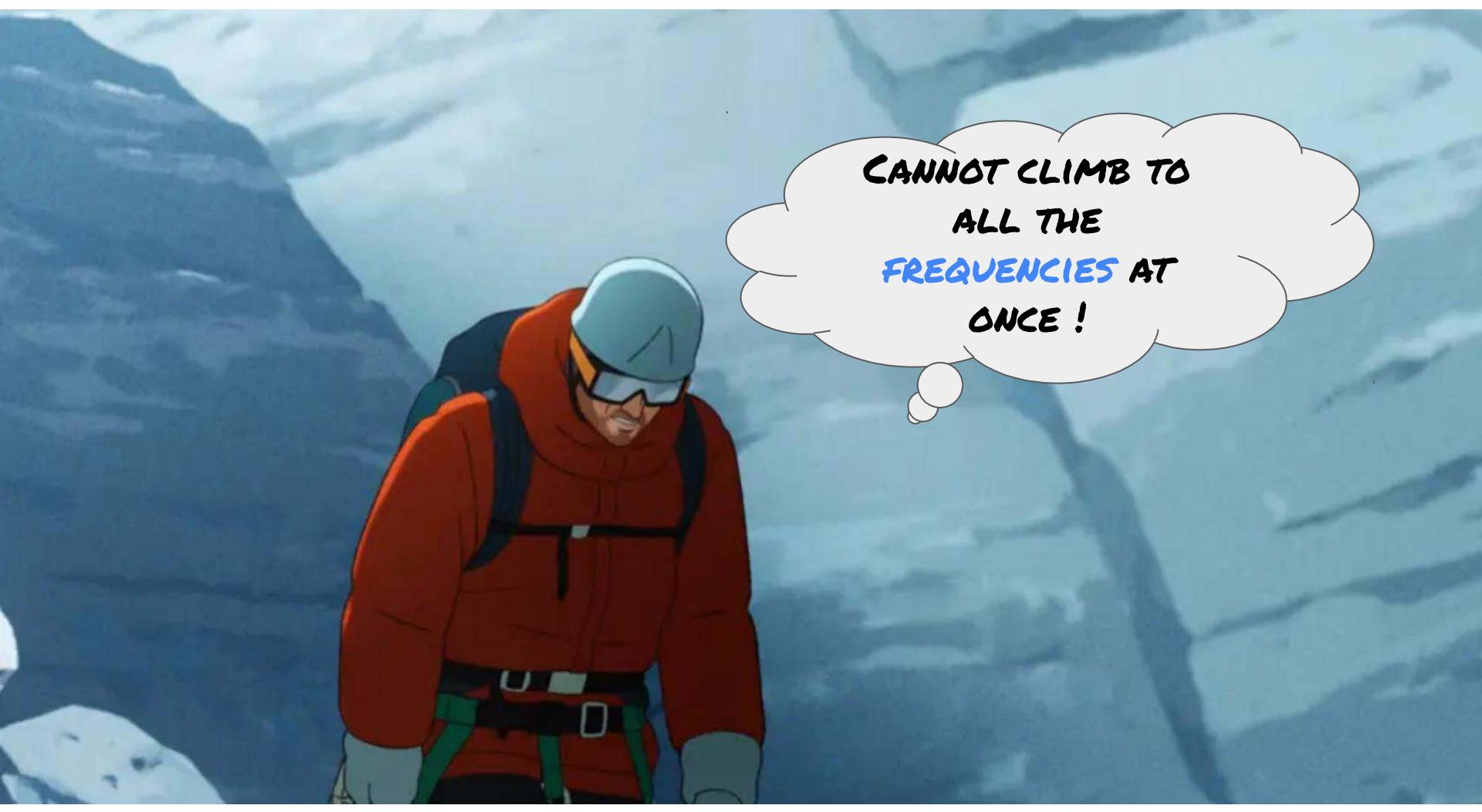
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PEAK WILL GIVE  
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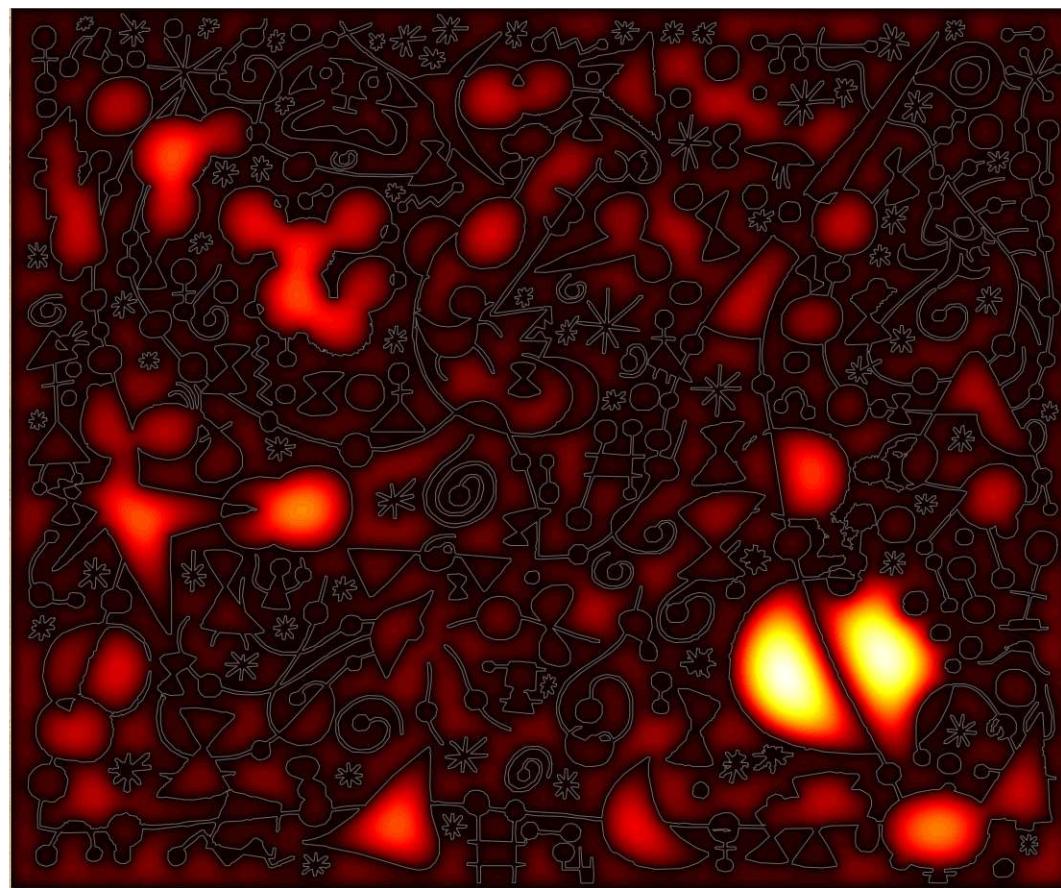


**Figure 3.** Some art

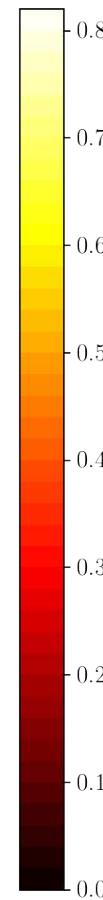


**Figure 4.** Joan Miró

$$\mathcal{L}u = 1$$

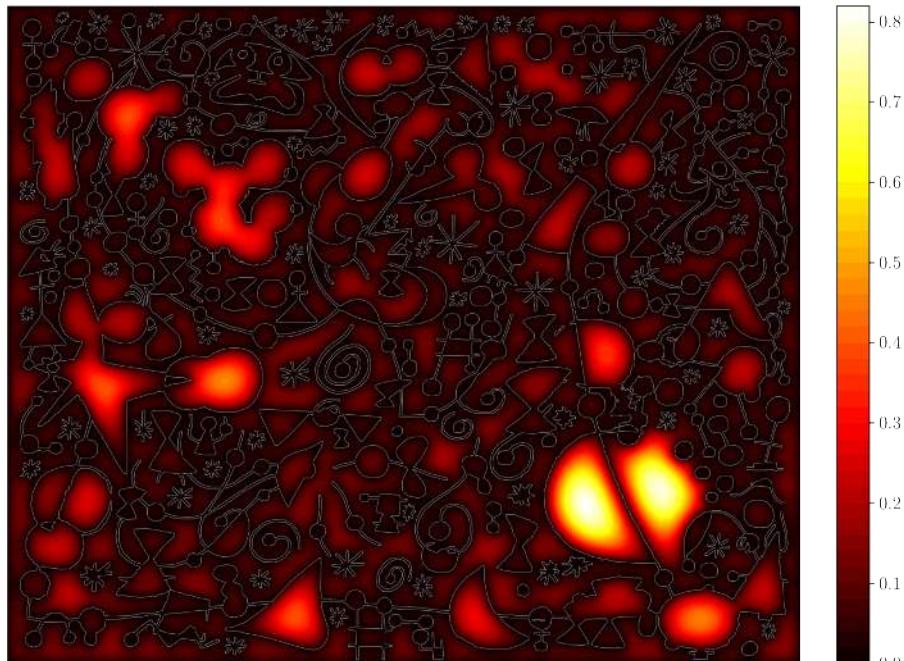


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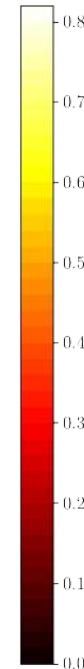
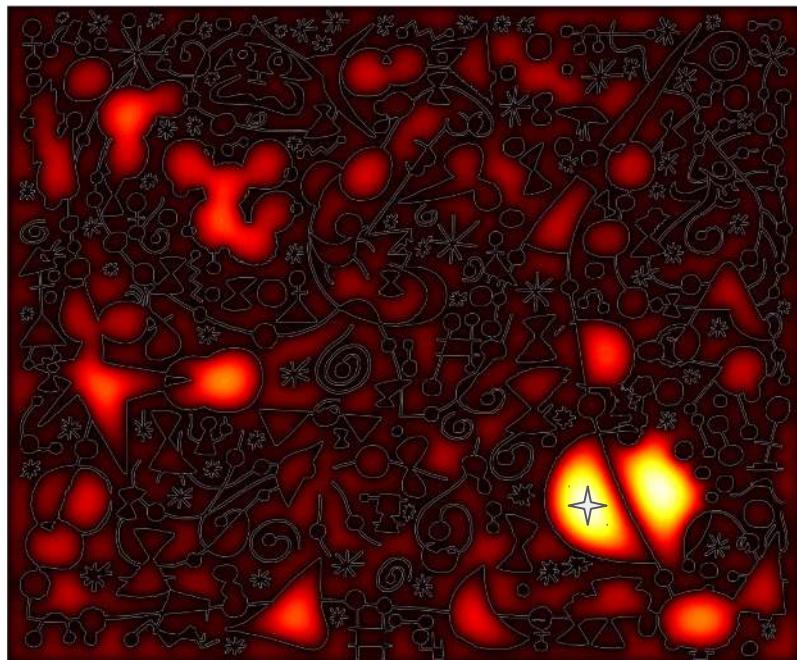
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# The landscape predicts mode localisation

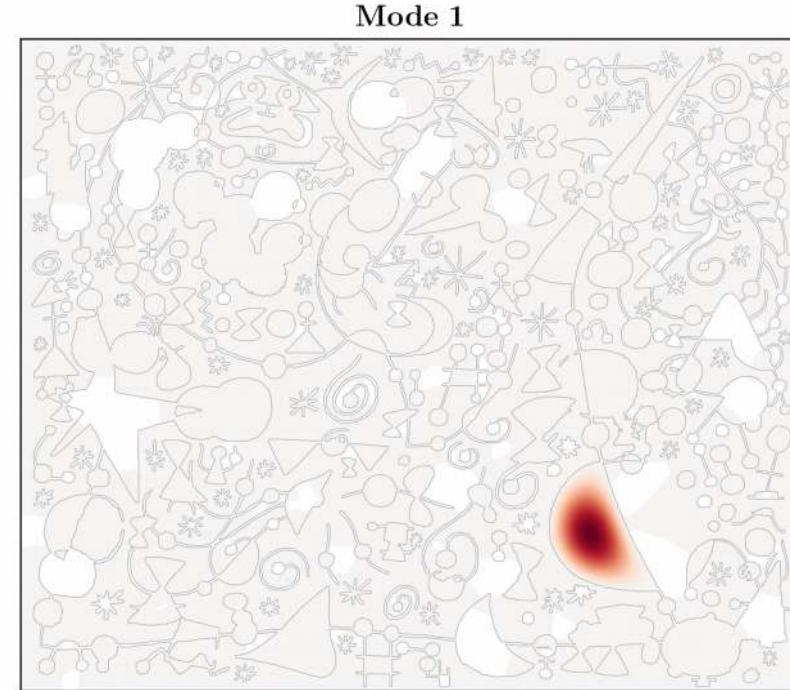


**Figure 5.** Some landscape

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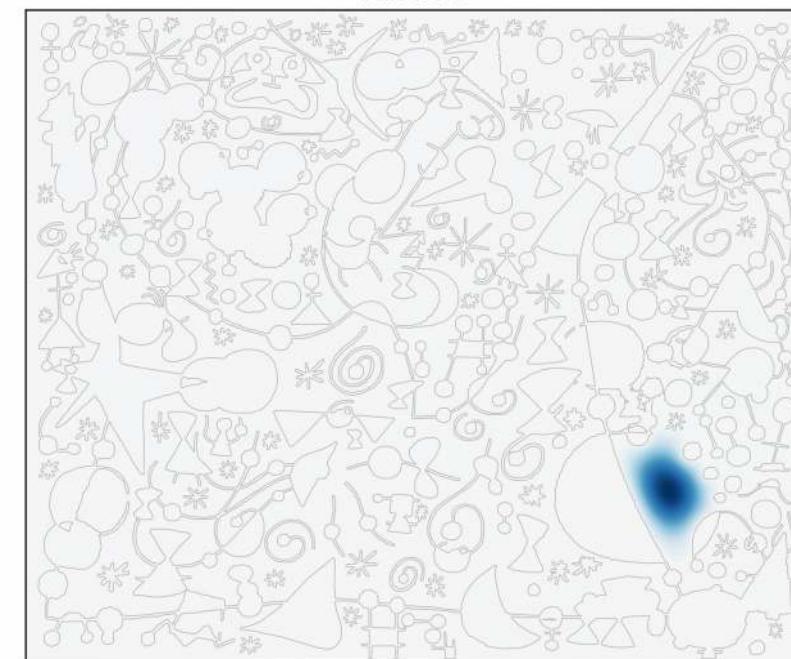
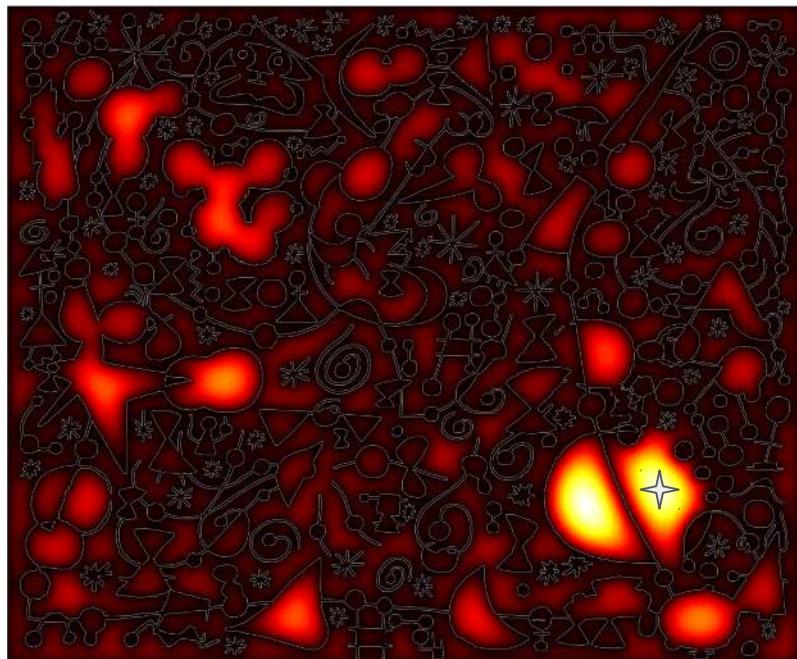


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**Figure 6.** Some modes

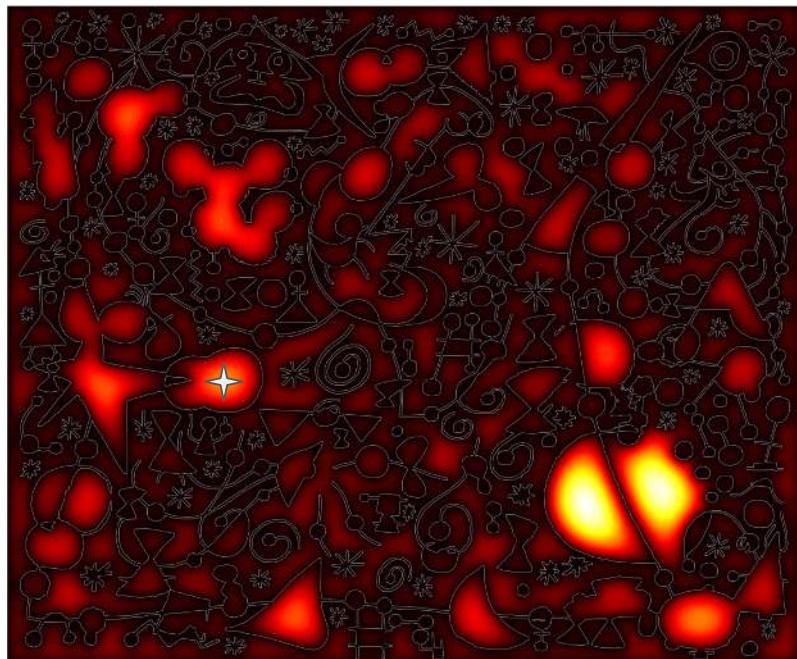
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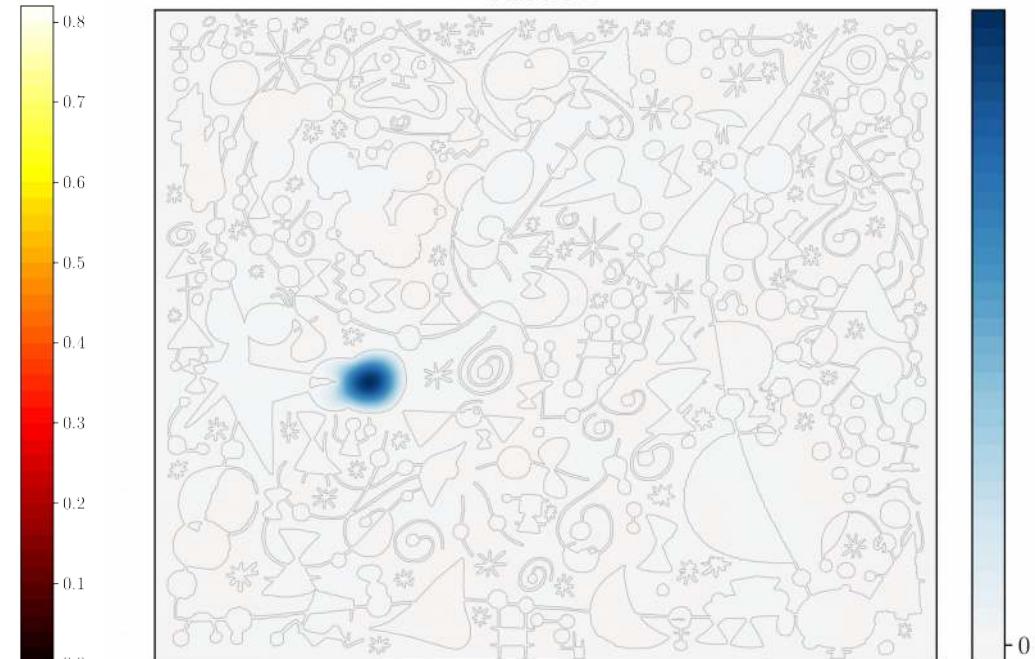
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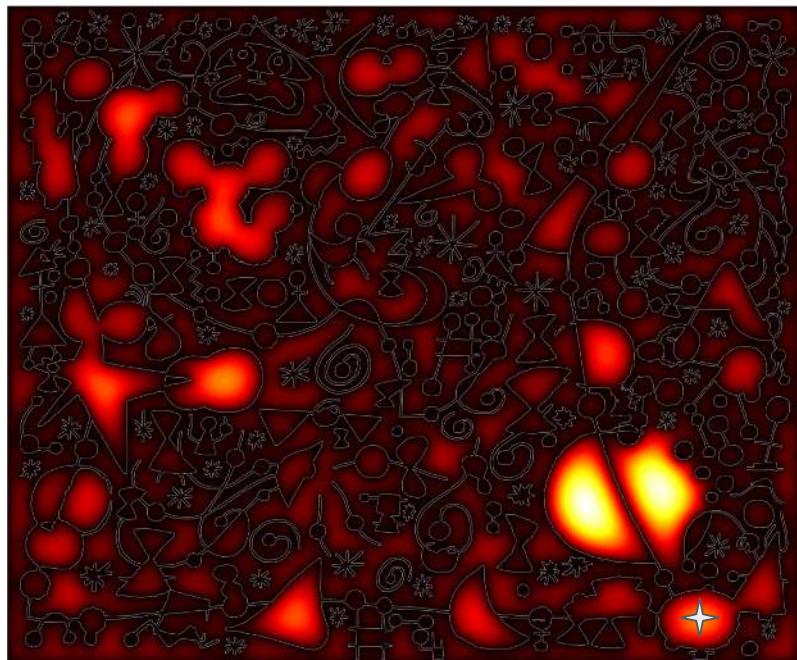


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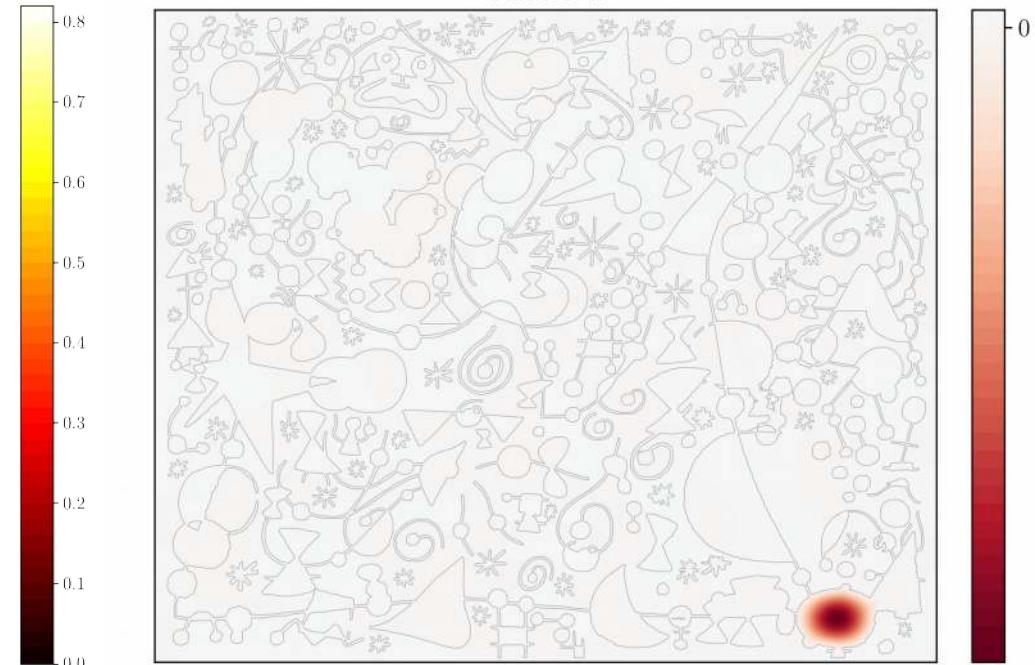


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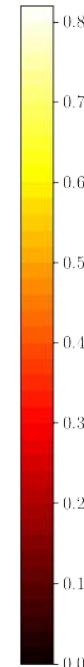
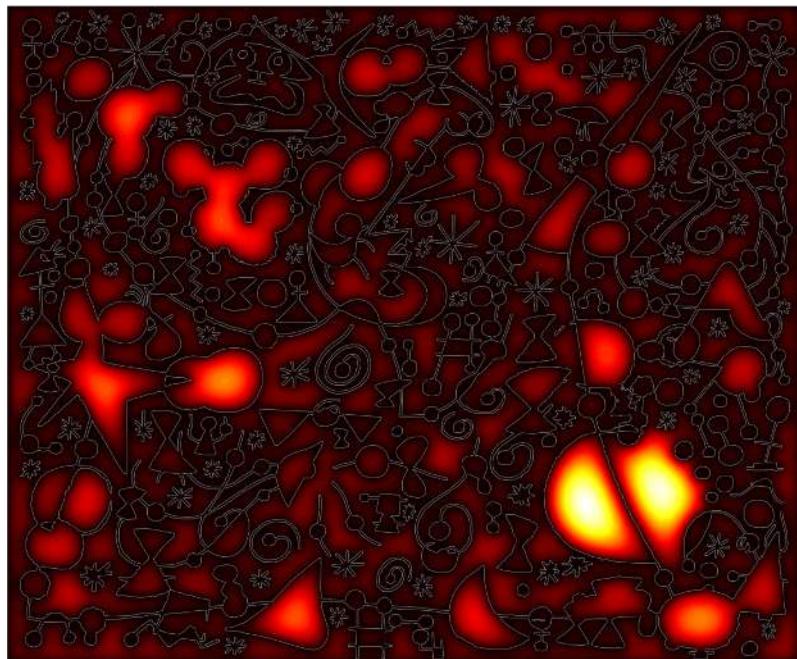


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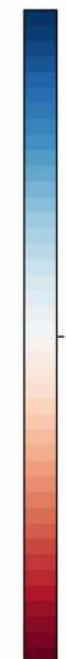
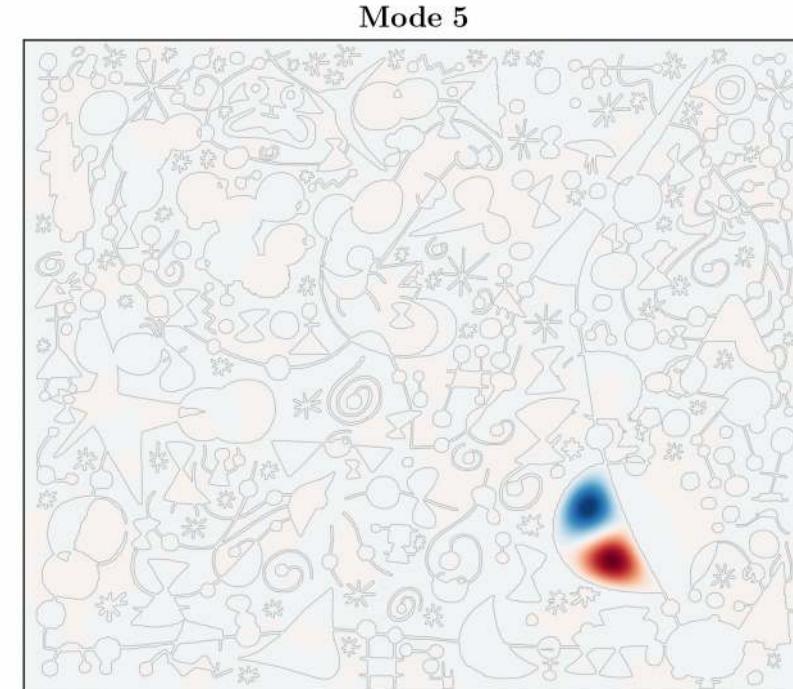


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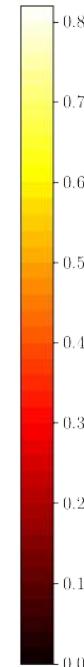
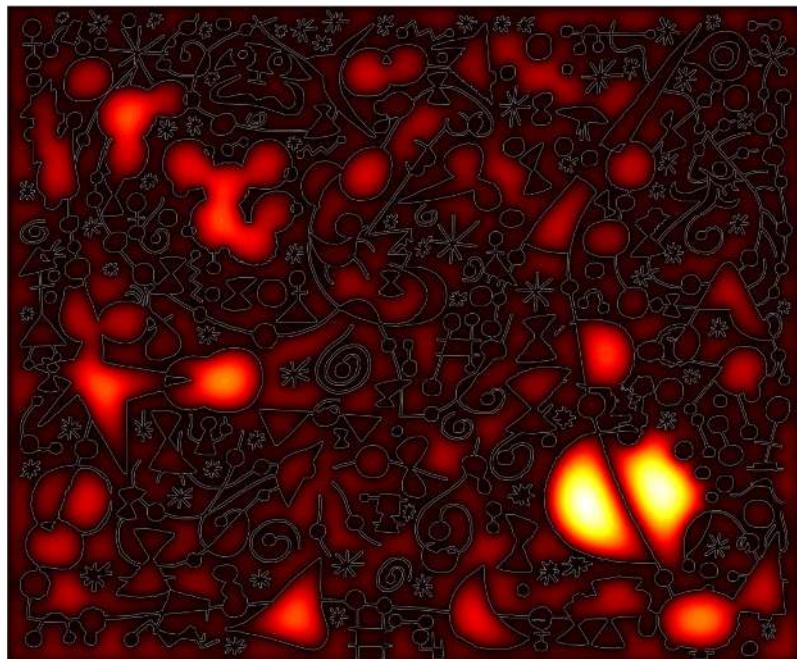


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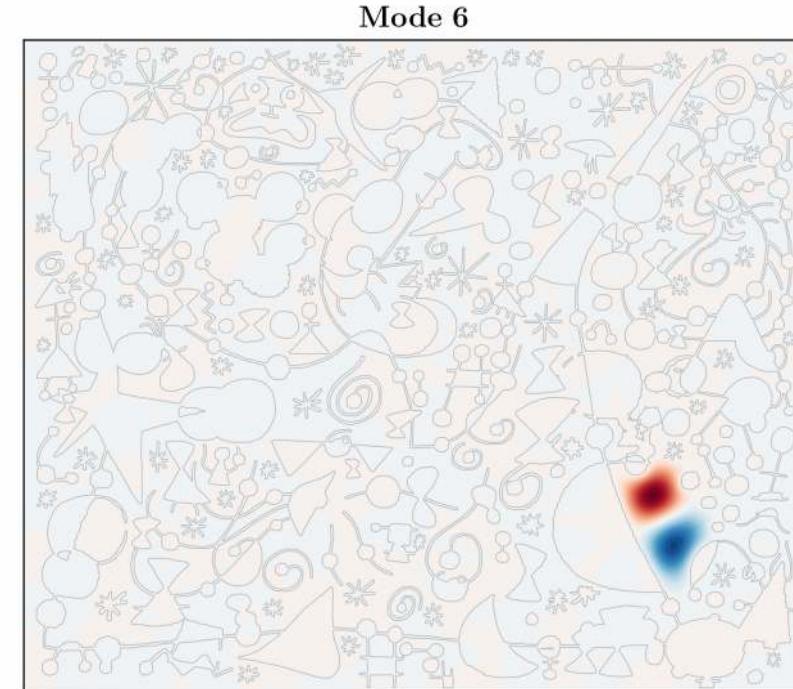


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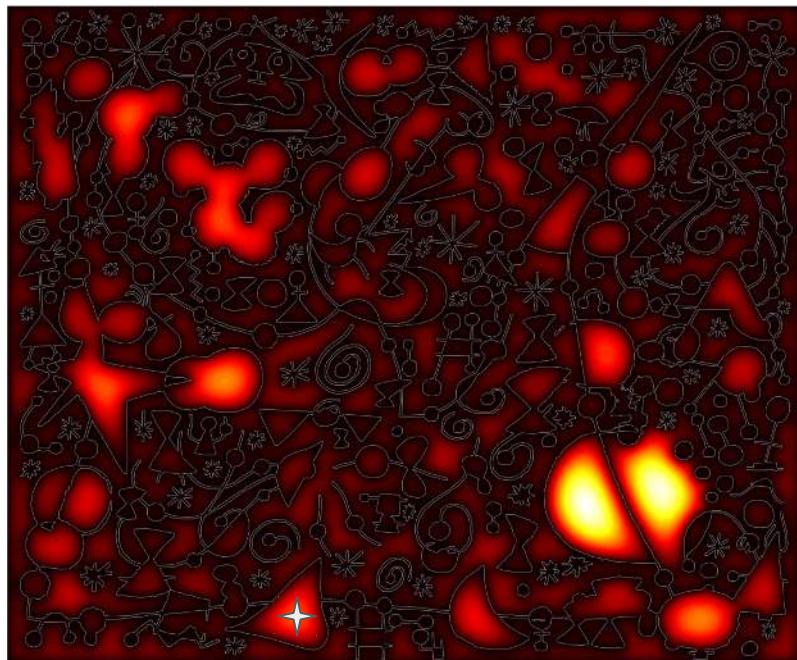


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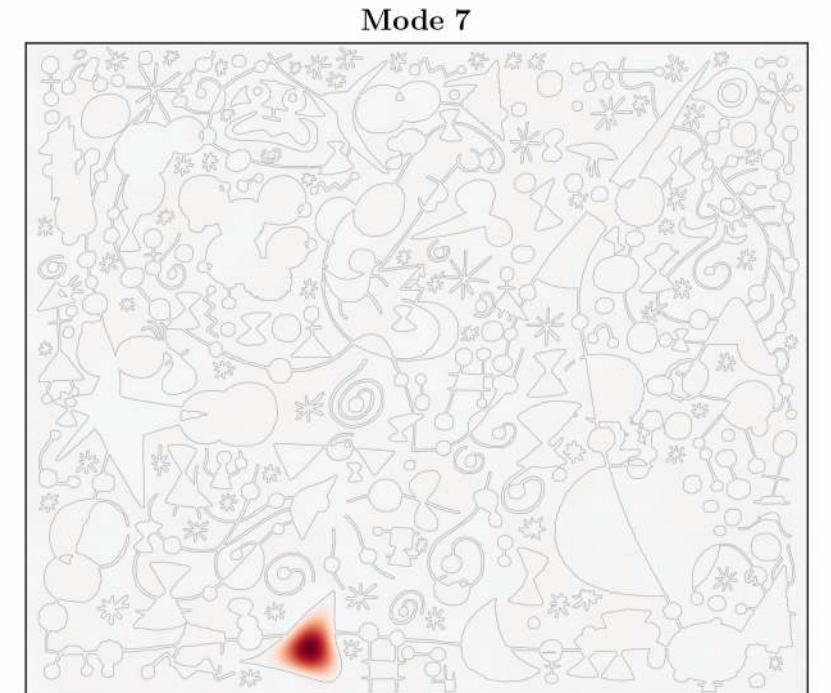


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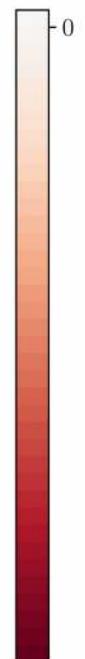
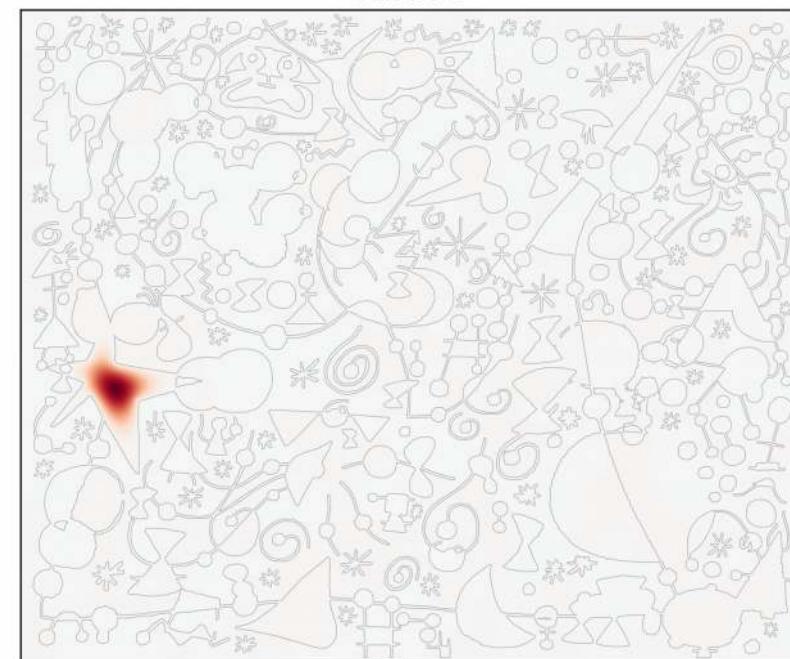
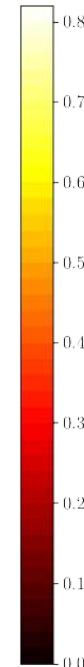
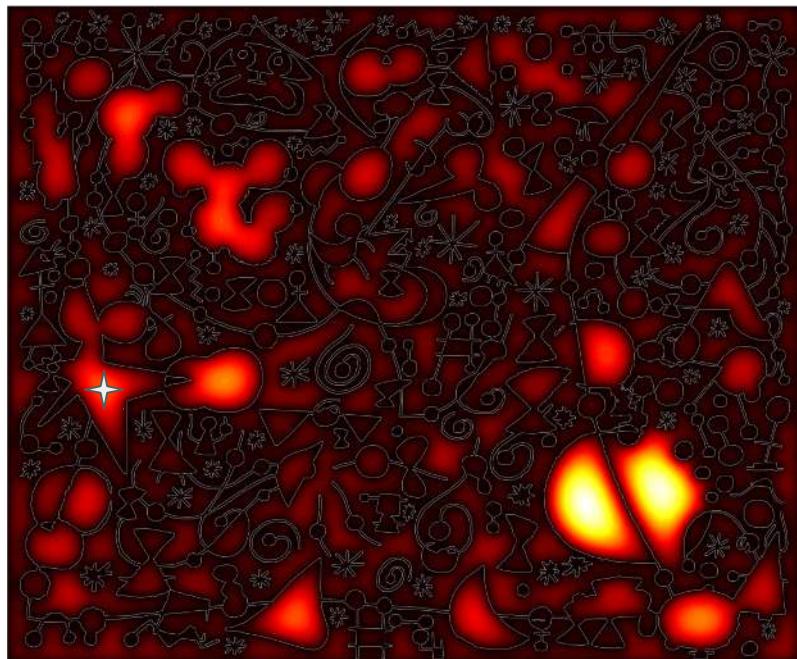


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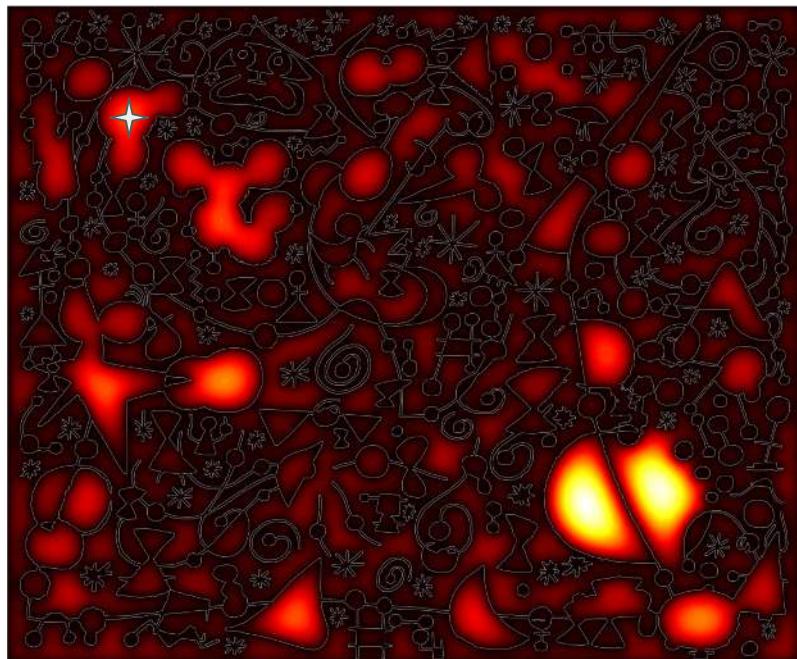
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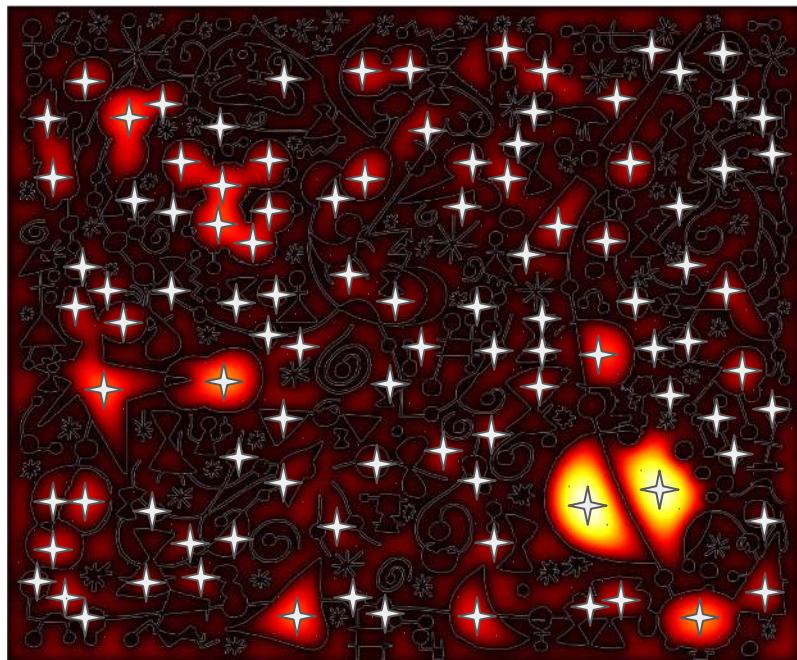
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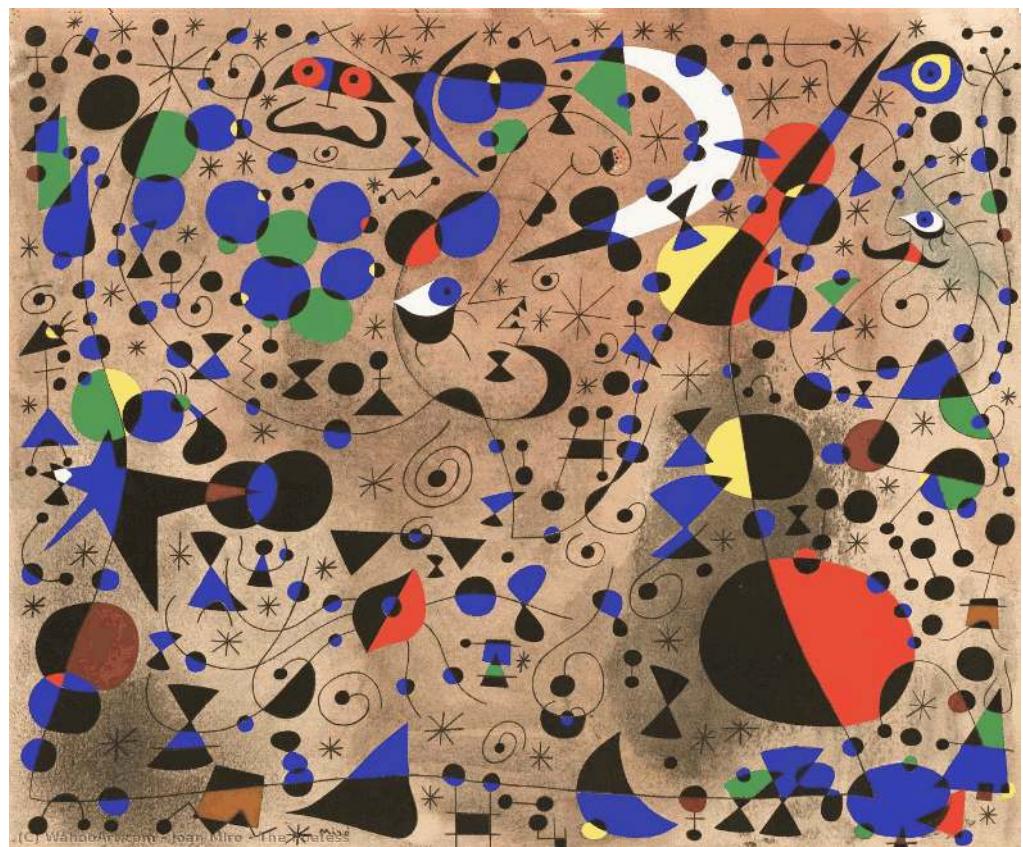
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- Describe the radiation from the landscape with



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- Describe the radiation from the landscape with
  - Acoustic power



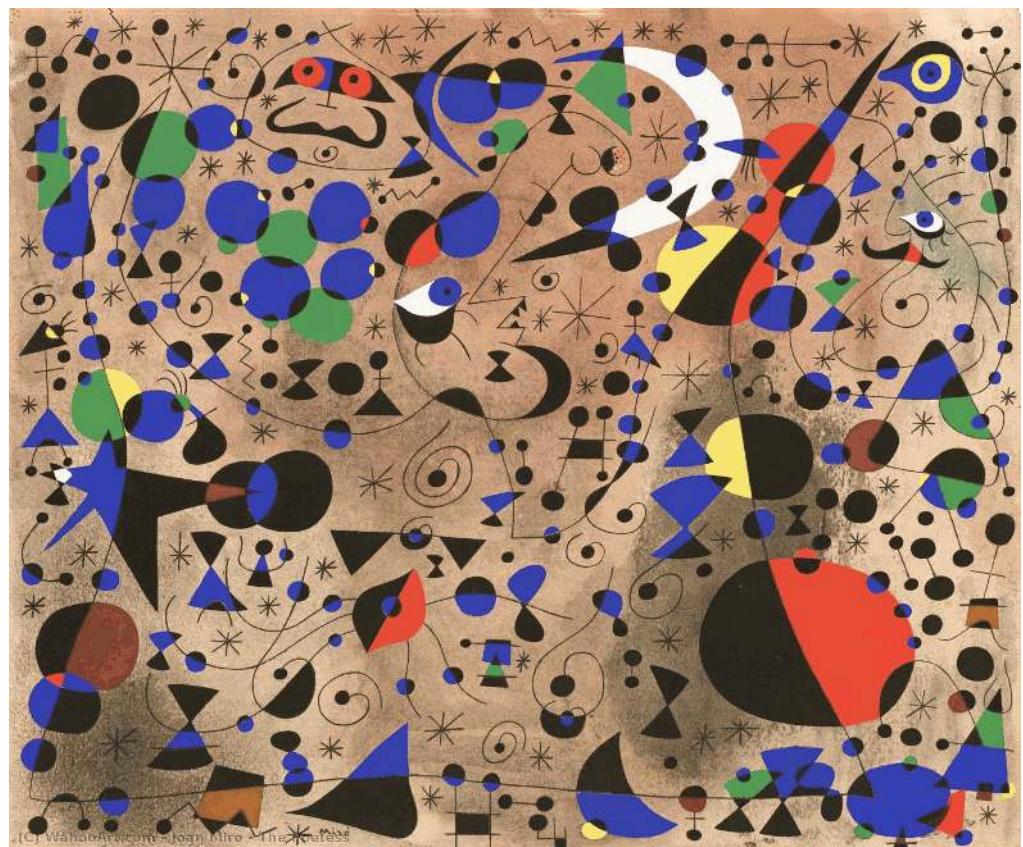
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- Describe the radiation from the landscape with
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  - Mean squared velocity



# Does the landscape predicts radiation?

- Describe the radiation from the landscape with
  - Acoustic power
  - Mean squared velocity
  - Radiation efficiency





merci !