

OHMi Pima County

# SONATAS - Listening to the Sounds of NATure to understAnd environmental changeS

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## Résumé

SONATAS est un projet de recherche multidisciplinaire visant à comprendre (i) comment les communautés et les populations locales perçoivent leurs paysages et leurs écosystèmes dans un contexte de fortes mutations des sociétés et de leur environnement ; et (ii) comment ces populations envisagent l'adaptation aux changements environnementaux à travers leurs environnements sonores immédiats. Notre projet est situé dans le comté de Pima (Arizona, États-Unis), confronté à de multiples changements sociologiques et environnementaux, notamment le réchauffement climatique, la pénurie d'eau ou l'urbanisation incontrôlée. L'OHMi Pima county a été créé dans la région pour répondre spécifiquement aux questions relatives aux dynamiques des socio-écosystèmes. Ce territoire fait notamment face à un important projet minier dont les conséquences sur l'environnement seront potentiellement lourdes. SONATAS vise à comprendre, au travers de l'étude des perceptions locales des paysages sonores, comment l'environnement est conçu par les communautés locales. Nous explorons la coexistence, sur un même territoire, de différents types de connaissances écologiques et les collaborations potentielles mises en place pour faire face aux changements.

## Abstract

SONATAS is a multidisciplinary research project aiming at grasping (i) how local communities and people perceive their landscapes and ecosystems in a context of strong mutations of societies and their environment ; and (ii) how they think about adaptation to environmental changes through their immediate sound environments, or soundscapes. The project is located in the Pima County (Arizona – USA) which is confronted to multiples sociological and environmental changes including climate warming, water scarcity or uncontrolled urbanization. Moreover, it is locally facing an important mine project with potentially strong environmental consequences. Sonatas aims to understand through sounds experiences and perceptions how the environment is locally conceived by local communities and whether it is seen as changing or immutable. Our objective is to explore how different types of ecological knowledge coexist within those communities in the context of major mutations and how people could collaborate together to face those changes.

# SONATAS

## Listening to the Sounds of NATURE to understand environmental changes

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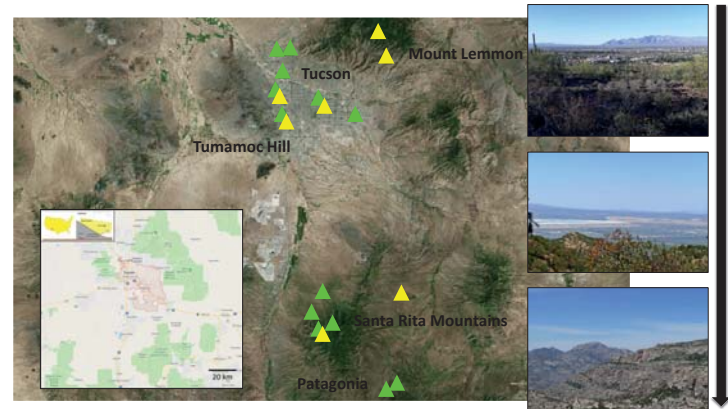


### Understanding environmental changes in Pima County, Arizona SONATAS a Multidisciplinary research project

Sonatas invests the soundscape research field linking bio-acoustics, landscape ecology, geography & anthropology, to understand environmental changes through the sounds of nature in urban and rural settings.

Sonatas aims at grasping: (i) how local communities and people perceive their landscapes and ecosystems through their immediate sound environments; and (ii) how they think about adaptation to environmental changes in a context of mutations of societies and their environment.

Our project is located in the Pima County which is confronted to multiple sociological and environmental changes including climate warming, water scarcity, uncontrolled urbanization and especially rapidly developing mining project with potentially strong environmental consequences.



We work on a gradient of anthropic pressure – city of Tucson, mining sites and protected areas – to compare soundscapes and the changes affecting them.

**What soundscapes or sound environments tell us about how an ecosystem should be? How local people hear it, think it should sound like and what role play sounds in the development of local ecological knowledge ?**



**How soundscapes are impacted by environmental and sociological changes and how do local people perceive these changes through sound diversity?**

**We used passive acoustic recording to capture soundscapes and ethnography to document local knowledge associated to biodiversity and bird sounds**

**Preliminary results:** We described 14 classes of sound spectrogram profiles based on the 6 acoustic indices computed, and extracted the main sounds related to biophony, geophony and anthrophony in different locations. We will compare the sound compositions between those locations based on the level of anthropic pressure and the land use composition of the surrounding landscape. In the framework of a longer-term project, we will compare these sounds with future recordings to observe variations in the sound composition among different seasons or years, in response to ongoing and future environmental changes.

Through interviews, notably with birdwatchers and naturalists, we will compare sonogram analysis with local perception of sounds to identify potential gaps between what is heard, seen and what is actually occurring in the studied sites.

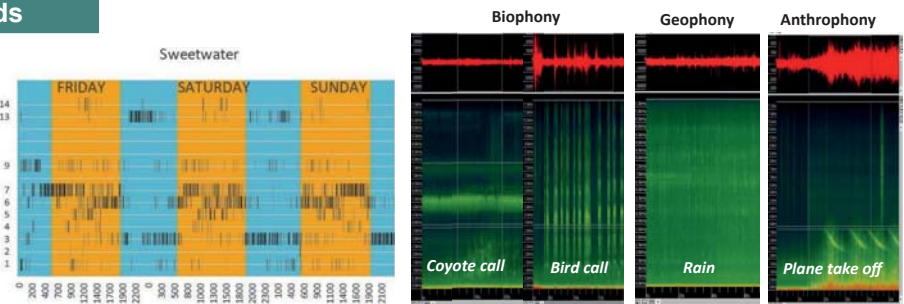
**What's a soundscape?** : The concept of soundscape, defined by Canadian composer and naturalist R. Murray Schafer, refers to the **different sound sources that make up a landscape**. For ecologists, soundscapes correspond to the sound dimension of landscapes and can be broken down into three components: **geophony, biophony and anthrophony**. For social scientists, soundscapes or sound environments are witnesses or **revelators of social representations, local knowledge and cultural affiliations** and their components need to be apprehended globally together.

**Our data** : 20 locations and 700 hours of recordings using SoundMeter4 (green triangles) and ZoomH4N (yellow triangles) on a 3 months period + Interviews and observations of birdwatchers (data collection and analysis *in progress*)



Example of extracted sonogram from the recordings.

**Our analyses:** sound analysis and computation of 6 acoustic diversity indices (acoustic diversity index ; acoustic evenness index ; acoustic complexity index ; bioacoustic index ; Normalized Difference Soundscape Index ; H / Total entrop).



**Sonatas aims to understand through sounds experiences and perceptions how the environment is conceived by local communities and whether it is seen as changing or immutable. Our objective is to explore how different types of ecological knowledge coexist within those communities in the context of major mutations and how people could collaborate together to face those changes.**

