



# Observatory of the environment in New Caledonia

Contribution to bushfires monitoring,  
environmental impact assessment  
and future risks in NC

Nouméa – 17 september 2020

France and Australia

Bushfire Science Workshop



# OUR MISSIONS

OEIL « ...provides New Caledonian stakeholders with **objective, reliable and comparable information on the environmental status to enable them to orientate their decisions on solutions to keep the environment in good conditions...** »

[www.oeil.nc](http://www.oeil.nc)

## Monitoring

We monitor the environment, the pressures it is undergoing and the solutions provided.



## Indicators

We develop and optimize environmental monitoring tools: indicators, variables, descriptors, key numbers...



## Communication

We broadcast information by informing public authorities, decision-makers and the public by all appropriate means



# BUSHFIRES IN NEW CALEDONIA - CONTEXT

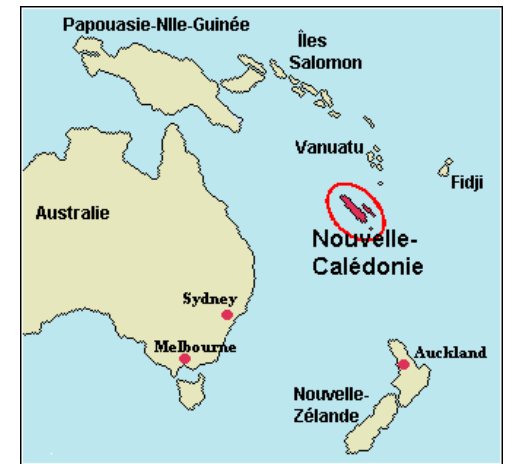
## New Caledonia → a biodiversity hotspot

- > 3000 plants - high endemic rates (75%)
- A unique and threatened terrestrial fauna
- 1/3 of the pristine corals reefs...

## Main environmental pressures in NC →

**Bushfires**, invasive species, mining exploitation.

- **10 000 to 40 000 Hectares per year**
- **99% triggered by human**
- **Impacts on threatened species, relictual ecosystems...**



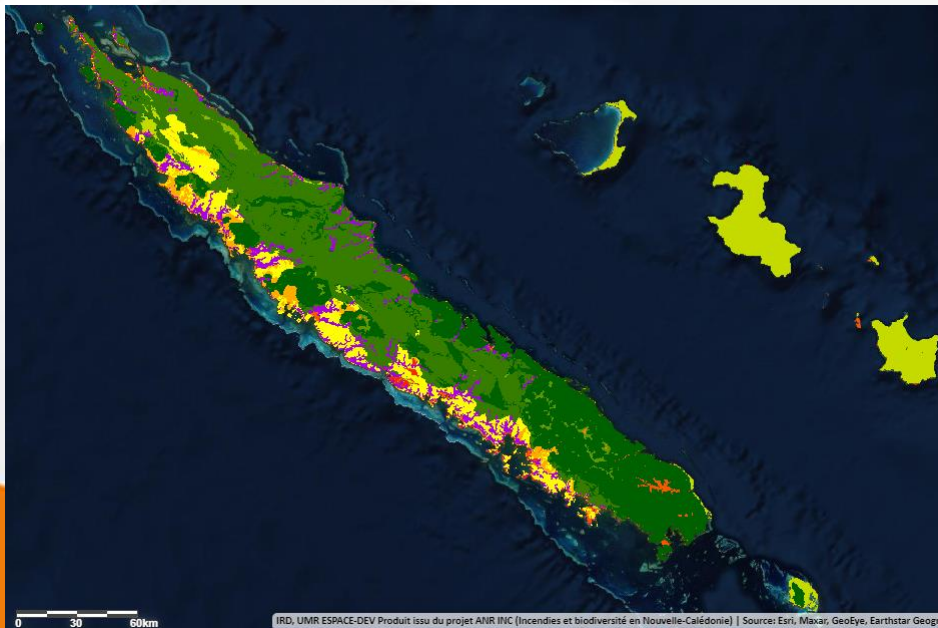
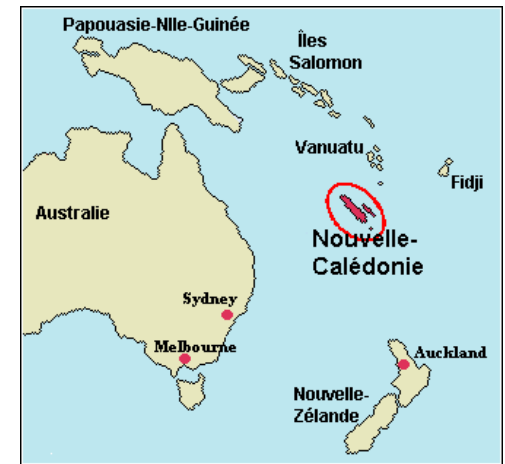
# BUSHFIRES IN NEW CALEDONIA - CONTEXT

## New Caledonia → a biodiversity hotspot

- > 3000 plants - high endemic rates (75%)
- A unique and threatened terrestrial fauna
- 1/3 of the pristine corals reefs...

## Main environmental pressures in NC →

**Bushfires**, invasive species, mining exploitation.



**Potential forest cover: 79,4%**

**Current forest cover: 35,4%**

Source: ANR – INC



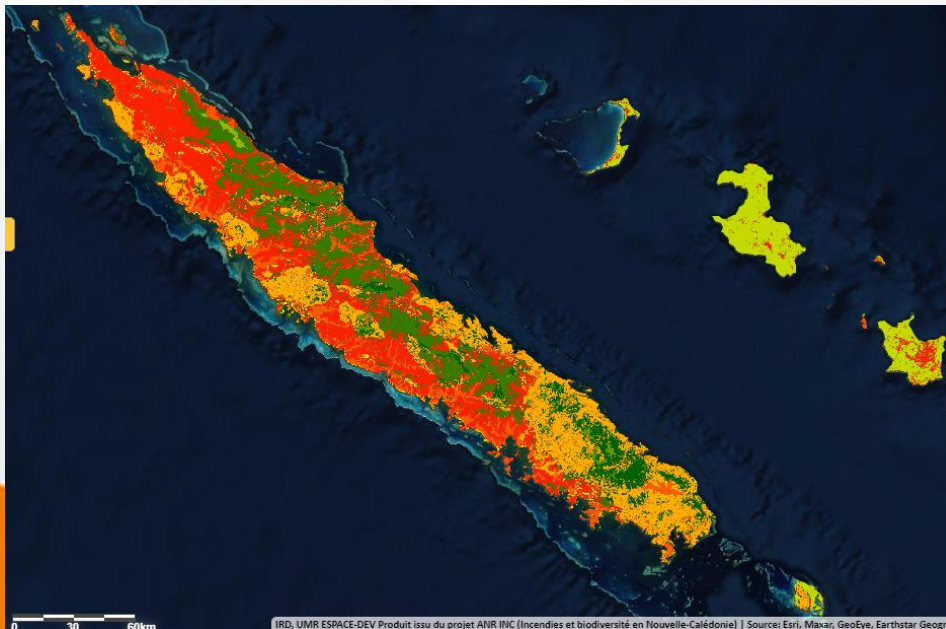
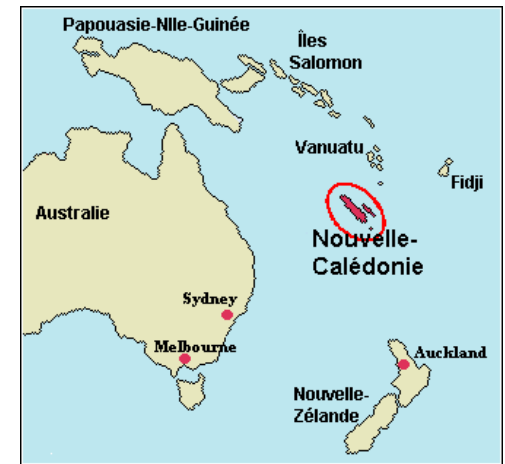
# BUSHFIRES IN NEW CALEDONIA - CONTEXT

## New Caledonia → a biodiversity hotspot

- > 3000 plants - high endemic rates (75%)
- A unique and threatened terrestrial fauna
- 1/3 of the pristine corals reefs...

## Main environmental pressures in NC →

**Bushfires**, invasive species, mining exploitation.



Potential forest cover: 79,4%

**Current forest cover: 35,4%**

Source: ANR – INC



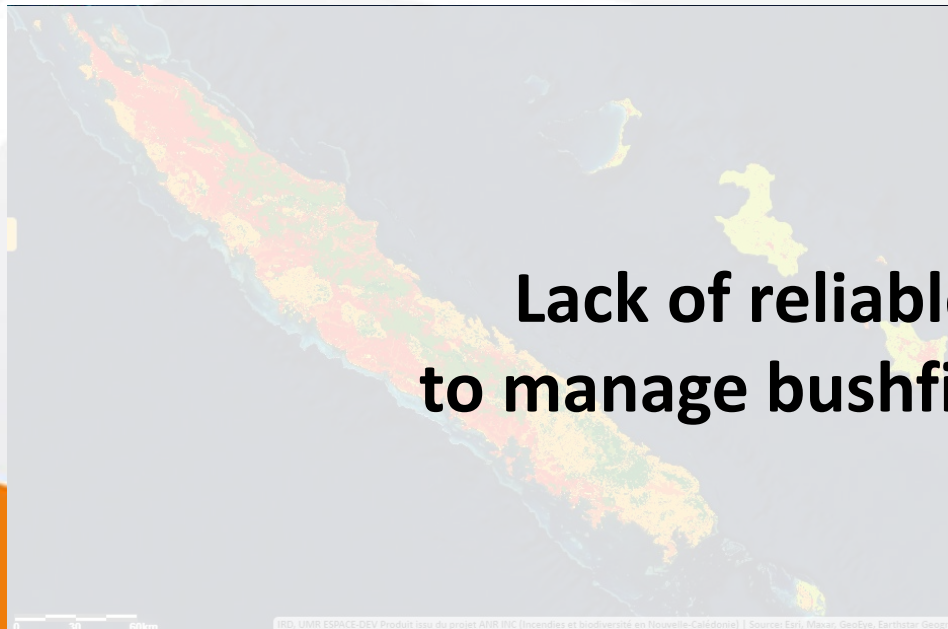
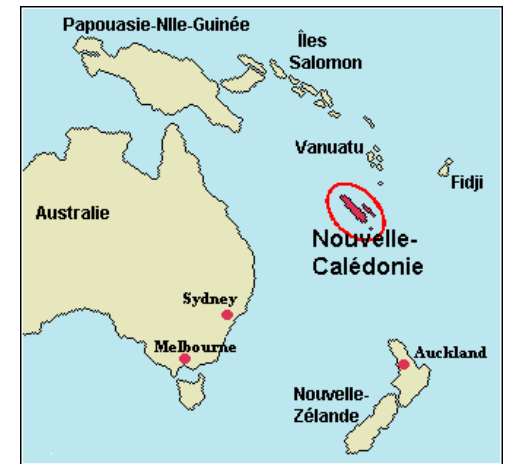
# BUSHFIRES IN NEW CALEDONIA - CONTEXT

## New Caledonia → a biodiversity hotspot

- > 3000 plants - high endemic rates (75%)
- A unique and threatened terrestrial fauna
- 1/3 of the pristine corals reefs...

## Main environmental pressures in NC →

**Bushfires**, invasive species, mining exploitation.



**Lack of reliable data  
to manage bushfires in NC**

Potential forest cover: 79,4%

Current forest cover: 35,4%

Source: ANR – INC



# OUR CONTRIBUTION SINCE 2016

- **Monitor bushfires and assess their environmental impacts**
- **Inform the stakeholders** (public authorities, decision-makers, population...)
- **Assist bushfire management**



***In 2019, 14% of the first bushfire alert received by the Fire Fighting Department was provided by OEIL's services***



# METHODS



- **Exploitation of free satellite imagery**



## Data available

## Main Use

- |   |   |                             |
|---|---|-----------------------------|
| • <b>MODIS (EOSDIS, NASA, University of Maryland)</b> | → | Data chronicle              |
| • <b>SUOMI (EOSDIS, NASA, University of Maryland)</b> | → | First delimitation of areas |
| • <b>HIMAWARI (jaxa, japan)</b>                       | → | Early fire detection- Alert |
| • <b>Sentinel 2 (ESA, Europe)</b>                     | → | Accurate delimitation       |

## Services

- **Geographical portal enabling data consultation and analysis**
- **Personalised fire alert system**
- **Bushfire monitoring and environmental assessment**

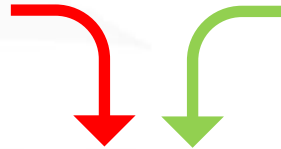


# GEOGRAPHICAL PORTAL

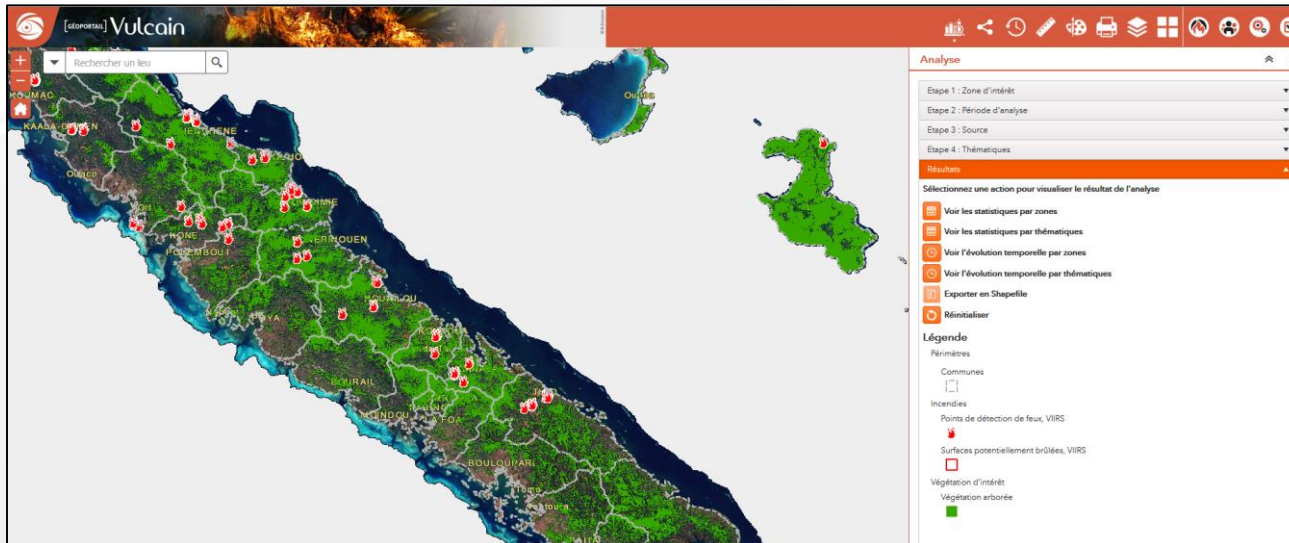
## VULCAIN : Data Consulting and Analysis Platform



Fire data:  
hotspot, areas



Local environmental  
data,  
Economic...



<http://geoportail.oeil.nc/alerteincendies>

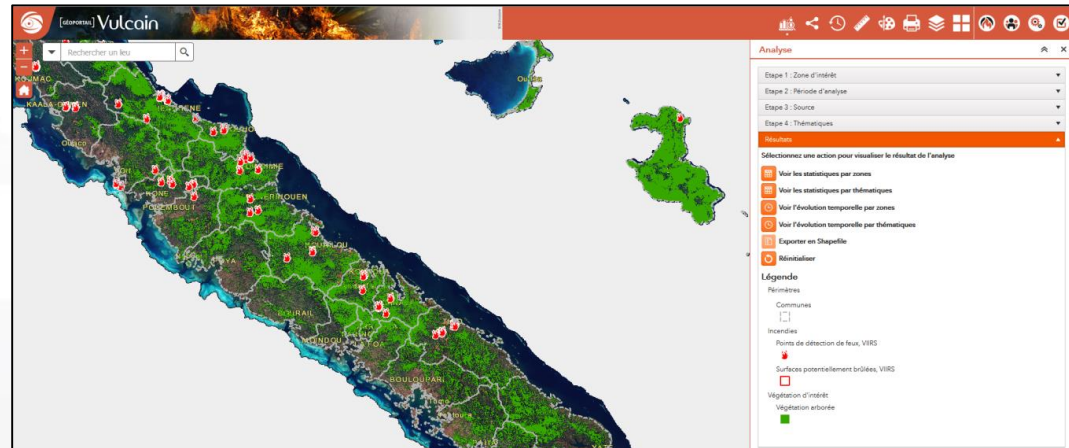


# GEOGRAPHICAL PORTAL

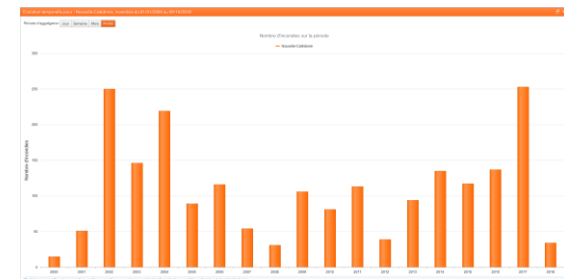
## VULCAIN : Data Consulting and Analysis Platform

**« What type of vegetation has been affected in the south province of New Caledonia for the last 5 years? »**

- Protected areas
- Threatened species
- Ecosystems (forests, mangrove...)
- Water resource
- Administrative perimeters
- Building and road...



Year	Zone	Type	Area	Value	Year	Value
2017	Province Sud	Vegetation arborée	Province de la Grande Terre	1	2017	10,00
2018	Province Sud	Vegetation arborée	Province de la Grande Terre	1	2018	10,00
2019	Province Sud	Vegetation arborée	Province de la Grande Terre	1	2019	10,00
2020	Province Sud	Vegetation arborée	Province de la Grande Terre	1	2020	10,00
2021	Province Sud	Vegetation arborée	Province de la Grande Terre	1	2021	10,00



<http://geoportail.oeil.nc/alerteincendies>



**Excel and  
PDF Export**



# PERSONALISED FIRE ALERT SYSTEM

## A single Email Alert Subscription Service

→ using local data and compiling 3 different satellite data (MODIS, SUOMI, HIMAWARI)

## Criteria selection

### Geographical

### Thematic

- Environment
- People and property
- Economic...

### Temporal

- Near real time
- Daily
- Weekly...

**ABONNEZ-VOUS**

CHERCHER SUR LE SITE

Recherche

Alerte Incendies - Abonnez-vous

Accueil > Alerte Incendies - Abonnez-vous

Soumis par lolita.righetti le mer, 12/20/2017 - 17:00

**Bienvenue sur la page d'abonnement aux alertes incendies de l'OEIL !**

En renseignant le formulaire suivant, vous vous abonnez à un service d'alertes par messagerie électronique. A vous de décider de la fréquence à laquelle vous les recevrez, de même que des critères de sélection des incendies qui vous seront signalés.\*

ADRESSE EMAIL  
e.g. nom@domaine.com

FRÉQUENCE D'ENVOI ?  
Immédiat

SÉLECTIONNEZ UNE OU PLUSIEURS ZONES D'INTÉRÊT ?  
Nouvelle-Calédonie x

SÉLECTIONNEZ UNE OU PLUSIEURS THÉMATIQUES (OPTIONNEL) ?  
Biens et personnes x Enjeux économiques x Sites d'intérêt x

Résultats des suivis

- Bilan Grand Sud
- Baromètre Biodiversité
- Incidents environnement
- Alerte Incendies

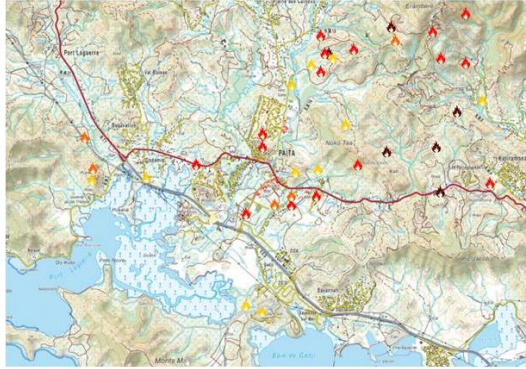
Boîte à outils

- Bibliothèque numérique
- Annuaire environnement
- Géoportail

# PERSONALISED FIRE ALERT SYSTEM

An email, containing simple information and

Carte de localisation des incendies pour la/les zone d'intérêt : [Païta-Dumbéa-Province Nord]



Sources de données : EOSDIS, OEIL  
Fonds cartographique : Gouvernement

Information/Avertissement :

Des incendies peuvent ne pas avoir été détectés pour plusieurs raisons :

- un feu est d'une dimension trop réduite pour être détecté
- un feu peut s'être allumé puis éteint entre le passage des satellites, et n'est donc plus visible
- une couverture nuageuse, la fumée générée par l'incendie ou une canopée épaisse empêchent la détection des incendies.
- un problème affectant le dispositif de détection

L'impression de l'emplacement géographique et l'estimation de surfaces (topologiques) des incendies ainsi que l'analyse variable de constitution des couches d'intérêt environnemental doivent conduire l'utilisateur du service à considérer le résultat

OEIL - alerte incendies et impacts environnementaux - Message (HTML)

De : Contact OEIL  
À : 'JOHNNY.HALLYDAY@ALLUMEZLEFEU.NC'  
Cc :  
Objet : OEIL - alerte incendies et impacts environnementaux

Date : Jeu. 15/03/2018 08:09

## OEIL - Alerte incendies du 07/03/2018

Vos critères d'abonnement :

- Fréquence d'envoi : Quotidien
- Zone d'intérêt : Nouvelle-Calédonie
- Thématique : Biens et personnes - Enjeux économiques - Sites d'intérêt - Végétation d'intérêt

Selon les critères définis dans votre abonnement, l'OEIL vous alerte de la détection des incendies suivants :

	Nombre d'incendies	
	Nouvelle-Calédonie	Voir sur la carte
Depuis le 01/03/2018	1 <a href="#">Lien</a>	
Depuis le 1er janvier	28 <a href="#">Lien</a>	

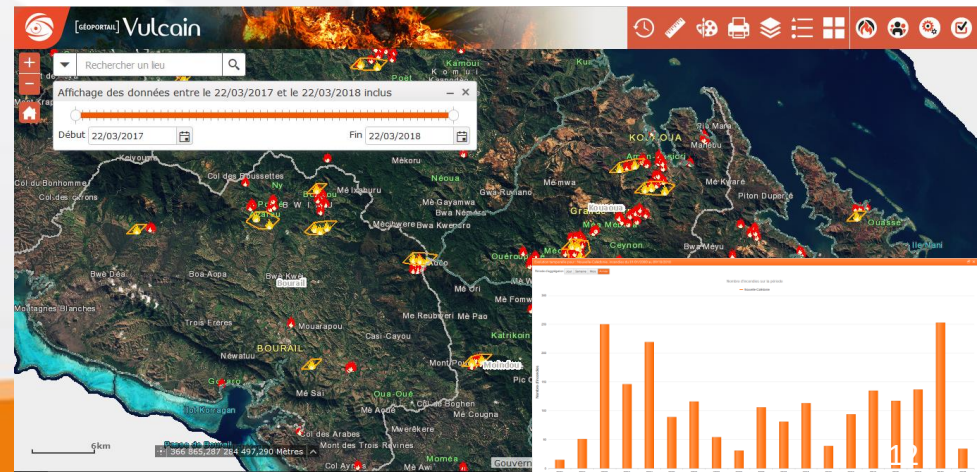
Sources des données : EOSDIS (MODIS et VIIRS)

Les zones d'intérêt suivantes ont été potentiellement impactées :

Période	Zone	Nombre d'incendies	Surface incendiée (en ha)	Thématique	Sous-thématique	Voir sur la carte
06/03/2018	Nouvelle-Calédonie	1	16,48	Sites d'intérêt	Zones tampons terrestres, UNESCO	<a href="#">Lien</a>
06/03/2018	Nouvelle-Calédonie	1	3,21	Végétation d'intérêt	Strate arbustive	<a href="#">Lien</a>

Sources de données : EOSDIS (VIIRS), C.E.N, Endemia, Fonds Nickel Gouvernement NC, OEIL, Province Sud, Sud Forêt, UNEP-WCMC, Vale NC, WWF

a link to the geoportal to produce specific analysis

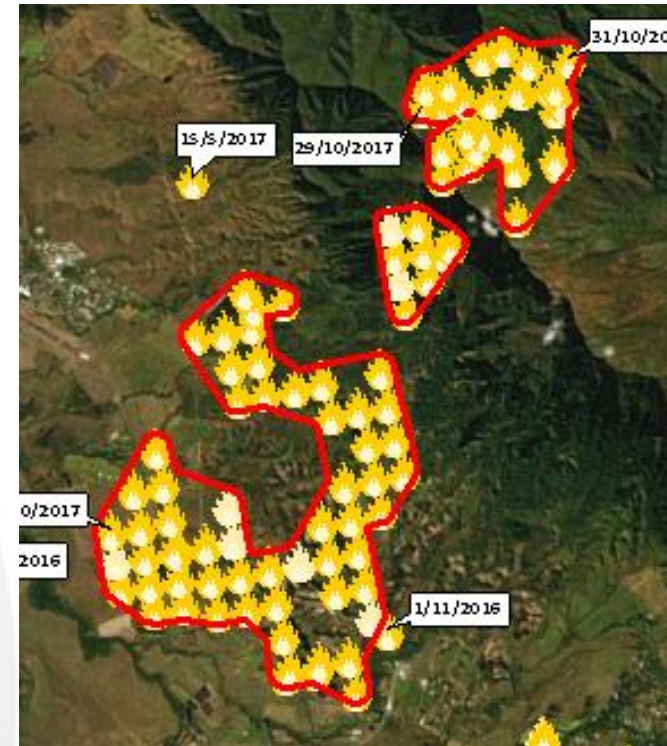


# BUSHFIRE MONITORING AND ENVIRONMENTAL ASSESSMENT

## First estimation using SUOMI's data

**Method** : determination of affected areas from SUOMI's hot spots. Criteria - distance, time and filters + environmental assessment.

**Frequency**: immediate



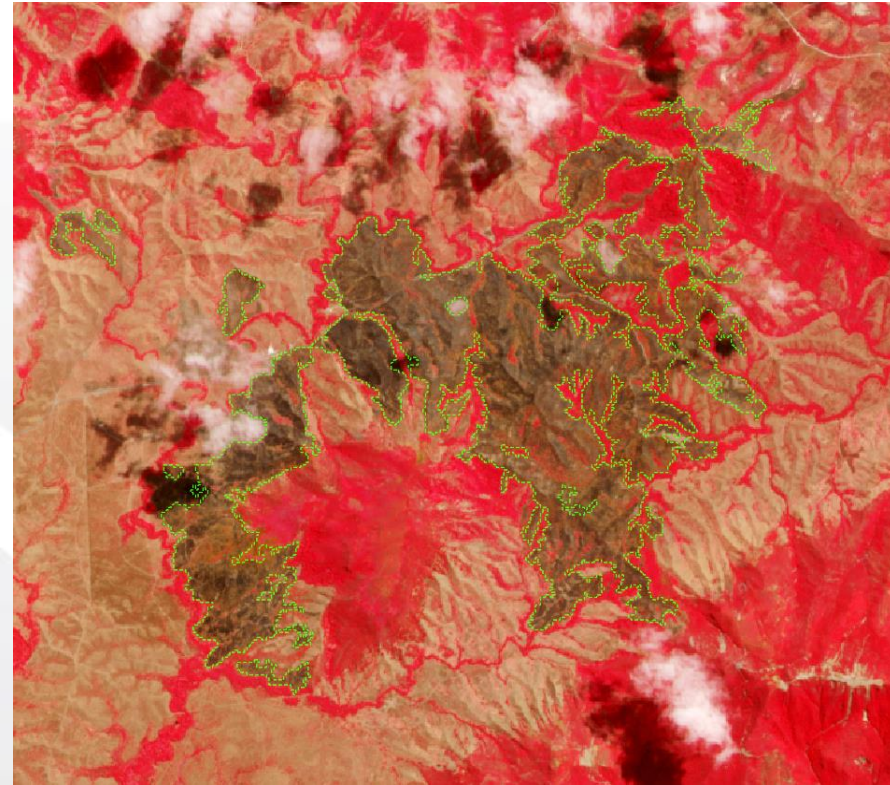
# BUSHFIRE MONITORING AND ENVIRONMENTAL ASSESSMENT

## Accurate monitoring using sentinel 2

2016-2017: R & D project  **INSiGHT**  
IMAGERIE NUMÉRIQUE & GEO-SOLUTIONS  
Development of an automated  
processing chain using sentinel 2

**Method:** semi-automated, analysis of all  
images available (>1000/year) +  
environmental assessment.

**Frequency:** annual



# BUSHFIRE MONITORING AND ENVIRONMENTAL ASSESSMENT

## Accurate monitoring using sentinel 2

2016-2017: R & D project   
Development of an automated  
processing chain using sentinel 2

**Method:** semi-automated, analysis of all  
images available (>1000/year) +  
environmental assessment.

**Frequency:** annual

**Operational for the whole territory,  
Accurate and innovative**



Rapport version 7

Analyse spatiale de l'impact environnemental des incendies  
de 2018 sur la Nouvelle-Calédonie

Auteurs : C. DE CLERCQ (OEIL), C. Bertrand (IGN), J-F. N'GUYEN VAN SOC (OEIL), F.  
ALBOUY (OEIL)  
Editeur : OEIL

Mars 2020



Observatoire de l'environnement  
en Nouvelle-Calédonie  
tel : 23 69 69  
www.oeil.nc

# FUTURE RISKS IN NEW CALEDONIA

A single study specific to New Caledonia:

**Dynamical downscaling of New Caledonia Climate: present-day and projections for the Late Twenty-First Century.**

**Source:** Geophysical Research Abstracts . 2019, Vol. 21, p1-1. 1p

**Author(s):** Menkes, Christophe; Dutheil, Cyril; Petit, Xavier; Lefèvre, Jérôme; Peltier, Alexandre; Bador, Margot





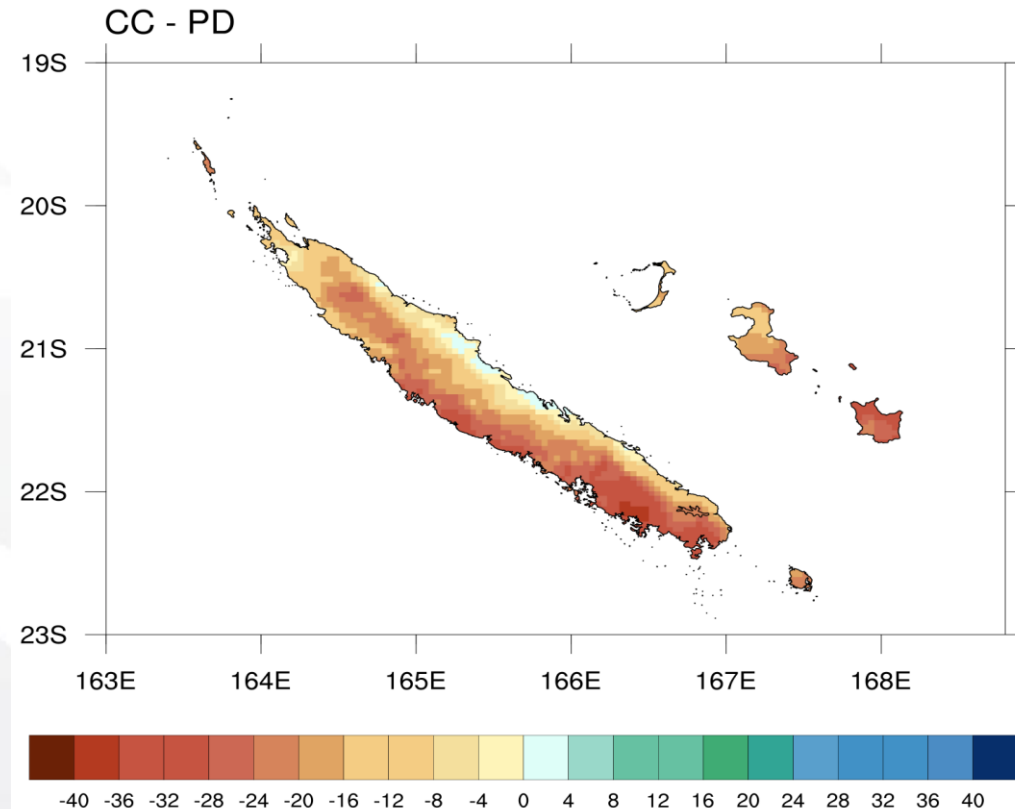
# FUTURE RISKS IN NEW CALEDONIA

## Rainfall Evolution

(2100-RCP8.5)

% Future- present

- **Approximately 20% decrease in precipitation across NC**
- **Contrast East/West and North/South**
- **Decrease in precipitation concentrated in the warm season (~75% of the annual decrease)**



Dynamical downscaling of New Caledonia Climate: present-day and projections for the Late Twenty-First Century.

Source: Geophysical Research Abstracts . 2019, Vol. 21, p1-1. 1p

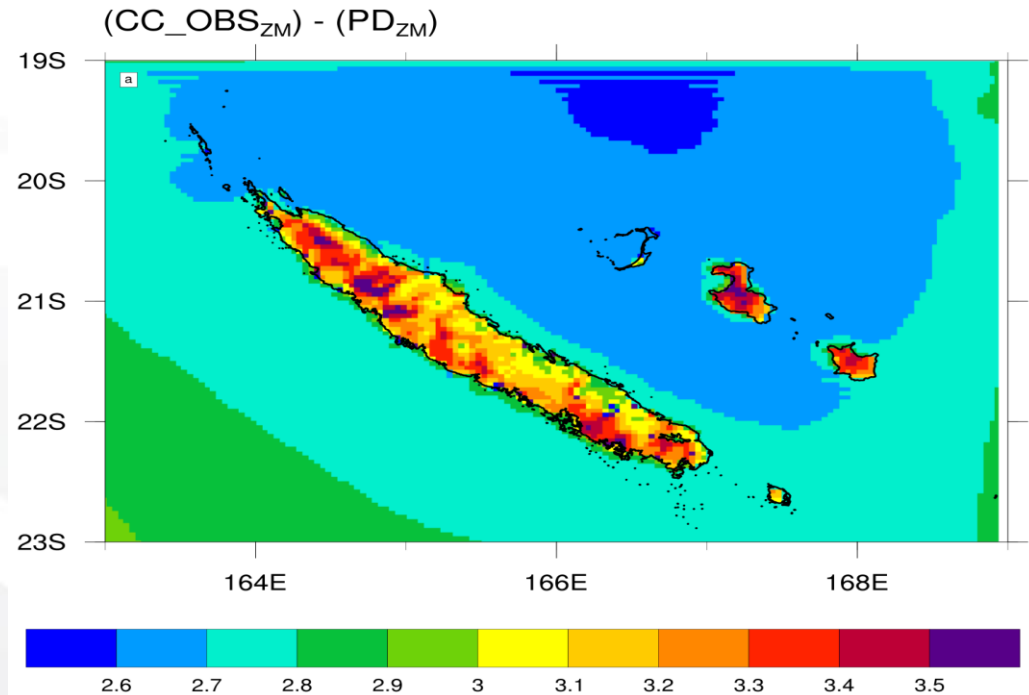
Author(s): Menkes, Christophe; Dutheil, Cyril; Petit, Xavier; Lefèvre, Jérôme; Peltier, Alexandre; Bador, Margot

# FUTURE RISKS IN NEW CALEDONIA

## Temperature forecast

(2100-RCP8.5)

- +3°C in New-Caledonia
- Contrast East/West coasts  
(-0.5°C)



Dynamical downscaling of New Caledonia Climate: present-day and projections for the Late Twenty-First Century.

Source: Geophysical Research Abstracts . 2019, Vol. 21, p1-1. 1p

Author(s): Menkes, Christophe; Dutheil, Cyril; Petit, Xavier; Lefèvre, Jérôme; Peltier, Alexandre; Bador, Margot

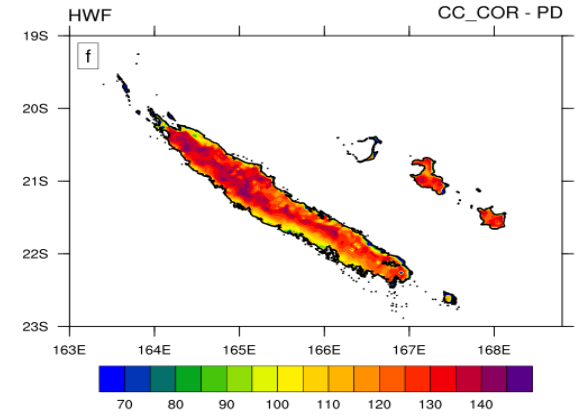
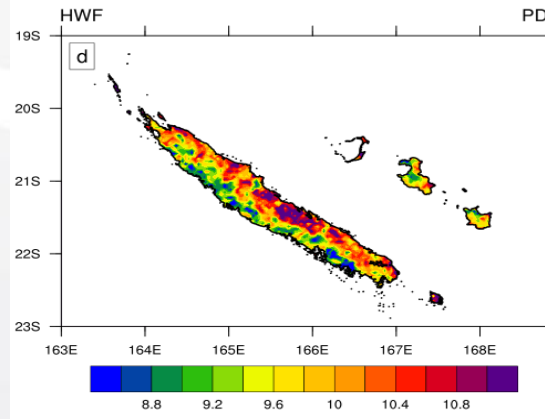
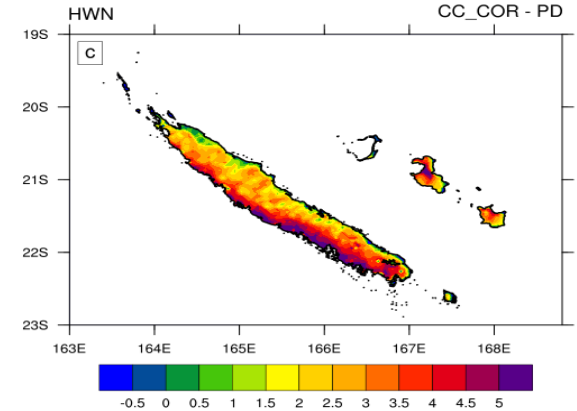
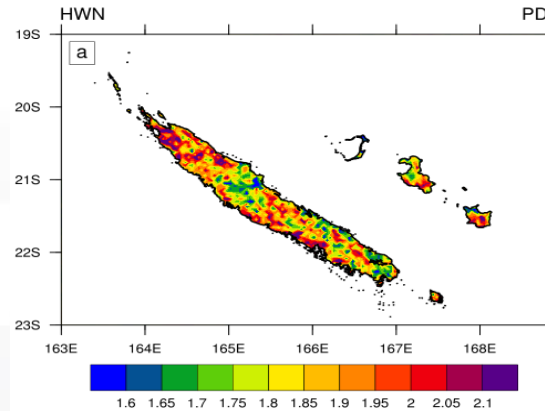
# FUTURE RISKS IN NEW CALEDONIA

## Heat waves

(2100-RCP8.5)

+ 120 days of heat

waves per year



Dynamical downscaling of New Caledonia Climate: present-day and projections for the Late Twenty-First Century.

Source: Geophysical Research Abstracts . 2019, Vol. 21, p1-1. 1p

Author(s): Menkes, Christophe; Dutheil, Cyril; Petit, Xavier; Lefèvre, Jérôme; Peltier, Alexandre; Bador, Margot

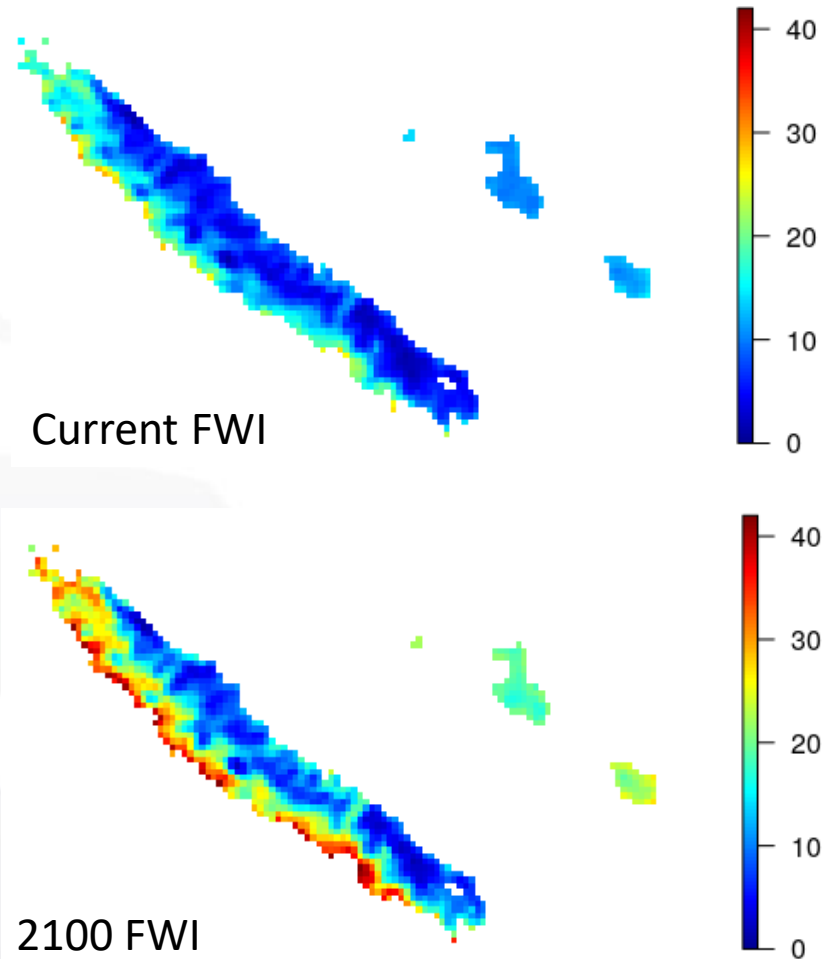
# FUTURE RISKS IN NEW CALEDONIA

## Forest Fire Weather Index

### - FWI

Adapted to NC during INC project

- Doubling the fire risk on the west coast
- Fire risk increased in currently low risk areas (relictual forests...)



Dynamical downscaling of New Caledonia Climate: present-day and projections for the Late Twenty-First Century.

Source: Geophysical Research Abstracts . 2019, Vol. 21, p1-1. 1p

Author(s): Menkes, Christophe; Dutheil, Cyril; Petit, Xavier; Lefèvre, Jérôme; Peltier, Alexandre; Bador, Margot

# FUTURE RISKS IN NEW CALEDONIA

## Forest Fire Weather Index

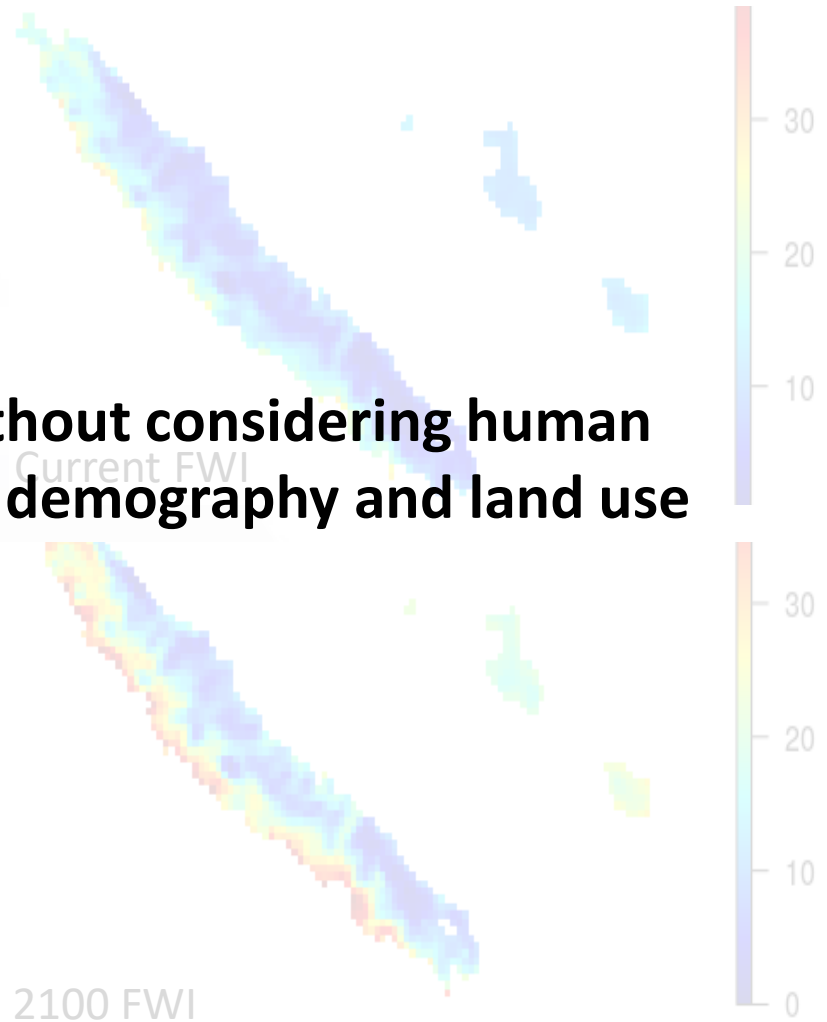
- FWI

Adapted to NC during INC project

Doubling the fire ignition mainly on the west coast

**Results obtained without considering human factors such as future demography and land use**

A fire risk increasing in currently low risk areas (relictual forests...)



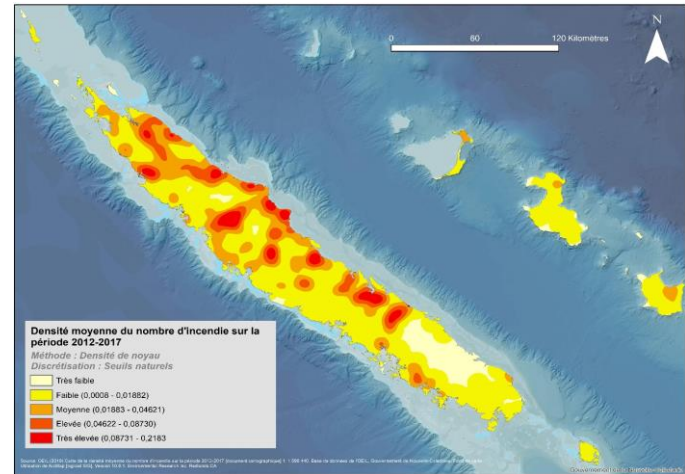
Dynamical downscaling of New Caledonia Climate: present-day and projections for the Late Twenty-First Century.

Source: Geophysical Research Abstracts . 2019, Vol. 21, p1-1. 1p

Author(s): Menkes, Christophe; Dutheil, Cyril; Petit, Xavier; Lefèvre, Jérôme; Peltier, Alexandre; Bador, Margot

# TO CONCLUDE

- **Bushfires** are a **major environmental pressure** in NC that we have started to characterise
- **A monitoring** of bushfires and an **assessment** of its environmental impacts are **conducted** by OEIL... but could be improved (complementary knowledge; new tech - radar, IoT, AI...)
- **Future risks seem high** but have **been little studied** (only one recent study dedicated to climate change in NC; potential effects unknown)
- **Open to collaborate!**



# THANK YOU FOR YOUR ATTENTION



Observatoire de l'environnement  
en Nouvelle-Calédonie

tel : 23 69 69  
www.oeil.nc

[Fabien.albouy@oeil.nc](mailto:Fabien.albouy@oeil.nc)  
[Adrien.bertaud@oeil.nc](mailto:Adrien.bertaud@oeil.nc)

Geoportal Vulcain:

<http://geoportail.oeil.nc/alerteincendies>

Fire Alert system:

<https://www.oeil.nc/fr/AlerteIncendies/APropos>

## Sources:

Analyse spatiale de l'impact environnemental des incendies de 2018 sur la Nouvelle-Calédonie

**Source:** OEIL, 2020

**Author(s):** C. DE CLERCQ (OEIL), C. Bertrand (IGN), J-F. N'GUYEN VAN SOC (OEIL), F. ALBOUY (OEIL)

Dynamical downscaling of New Caledonia Climate: present-day and projections for the Late Twenty-First Century.

**Source:** Geophysical Research Abstracts . 2019, Vol. 21, p1-1. 1p

**Author(s):** Menkes, Christophe; Dutheil, Cyril; Petit, Xavier; Lefèvre, Jérôme; Peltier, Alexandre; Bador, Margot

Wildfire risk for main vegetation units in a biodiversity hotspot: modeling approach in New Caledonia, South Pacific

**Source:** *Ecology and Evolution* 2015; 5( 2): 377– 390

**Author(s):** Céline Gomez Morgan Mangeas Thomas Curt Thomas Ibanez Jérôme Munzinger Pascal Dumas André Jérémie Marc Despinoy Christelle Hély

A spatially explicit integrative model for estimating the risk of wildfire impacts in New-Caledonia

**Source:** M. Mangeas, J. André, C. Gomez, M. Despinoy, G. Wattelez & T. Touraivane (2019)

**Author(s):** International Journal of Parallel, Emergent and Distributed Systems, 34:1, 37-52, DOI: [10.1080/17445760.2018.1430799](https://doi.org/10.1080/17445760.2018.1430799)

ANR project, INC - Incendies et biodiversité de écosystèmes en Nouvelle-Calédonie