

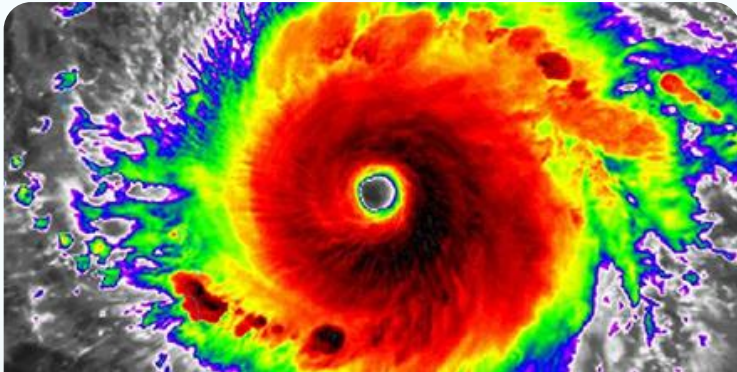
Parametric Insurance

Vincent Maarek & Toby Sansom

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Today's Agenda

Hopefully we can de-mystify the parametric insurance market and demonstrate its wide range of applications in risk management



What is 'parametric'?

Payouts based on an index that represents the risk. Quick payouts in real time when losses are triggered.



How are we using parametric insurance?

Quick payouts, deductible buy-downs, extra capacity, disaster relief and much more...



Looking forward: Innovation and growth...

A growing market spearheaded by innovation, new products and diverse participants.

Parametrics: The Basic Concept



The location

Coordinates,
circle area, grid /
mesh



The index

Precipitation
volume, hurricane
category, shaking
intensity



The payout scale

For a given index
value, we define a
fixed payout

Payouts are triggered by
events, not losses.

Parametric Insurance - Where did it Begin?



Aftermath of 1906 San Francisco Earthquake

Source: [USGS](#)

How did the Lloyds market respond?

The action mirrored the extreme event and meant that:

1. Claimants would have had quick access to money
2. The claims process was simple

Parametric Insurance as we know it today really picked up from the 1990s

1. Weather derivatives market
2. Parametric insurance
3. ILS / Catastrophe bonds

Source: [Lloyds of London](#)

Parametric Insurance - A Growing Market

Continuing to grow but also diversify into new products

Growth

- The data on this market is scarce....but
- 2021 market was ~ **USD 12bn**
- 2023 market was ~ **USD 15bn**
- Future growth predicted at **10-15%** (a bit above the traditional market)

Diversity

- The market is **diversifying**
- Across both perils + geographies
- Capacity providers / actors in the market
- **Diversity** of the products for the same peril





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Parametric Insurance 101

What is it and how does it work?

Parametric Insurance - The Key Benefits

Parametric covers are often designed by the broker/client, but also tailored by the insurer

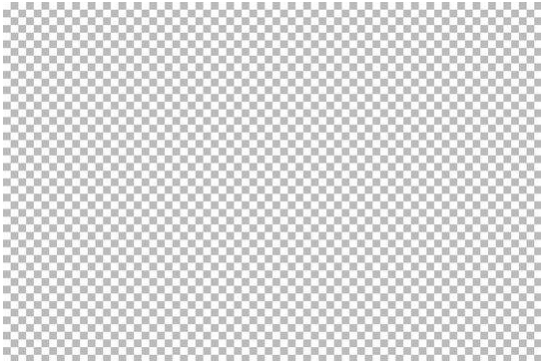
Flexible

The client adapts the index, thresholds and payouts to its risks.



Transparent

Indices are clear and simple. We know what will happen when an event occurs.



Fast

Once triggered, the client confirms its losses and receives its payment within hours.

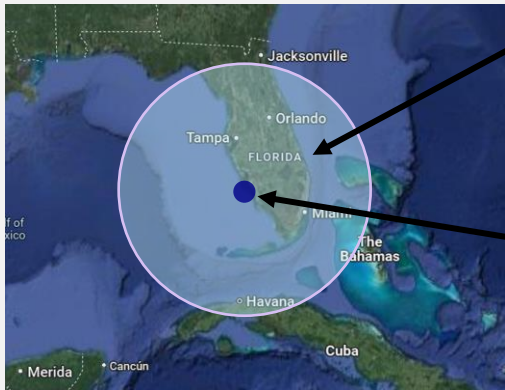


Tropical Cyclone - A Classic Example

Using 'cat-in-a-circle' style structures for tropical cyclone parametric insurance

The Structure:

Classical **cat-in-a-circle** structure – general damage area (adjustable)



50-mile radius circle around location

Exposure location

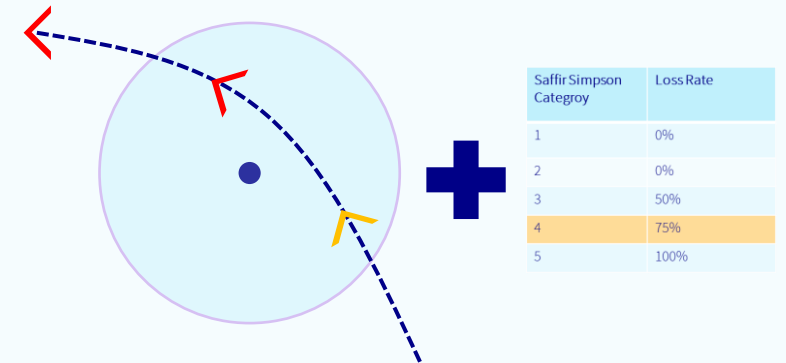
Any qualifying event entering the pre-defined circle will **trigger a loss**.

- The insured can **set the limit of cover** – e.g. USD 20mn
- Below: Parametric **payout schedule** for tropical cyclone - adjustable

Saffir Simpson Category	Loss Rate
1	0%
2	0%
3	50%
4	75%
5	100%

Loss Calculation:

For example, if the cyclone track on the diagram were a category 4



Saffir Simpson Category	Loss Rate
1	0%
2	0%
3	50%
4	75%
5	100%

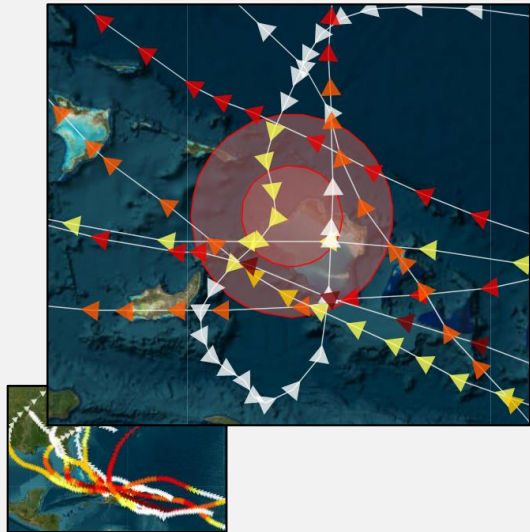
$20,000,000 * 75\% = \underline{15,000,000}$
payout

A Pricing Example - Tropical Cyclone

Building on the well-established catastrophe modelling field to calculate the probability of events

Burning cost

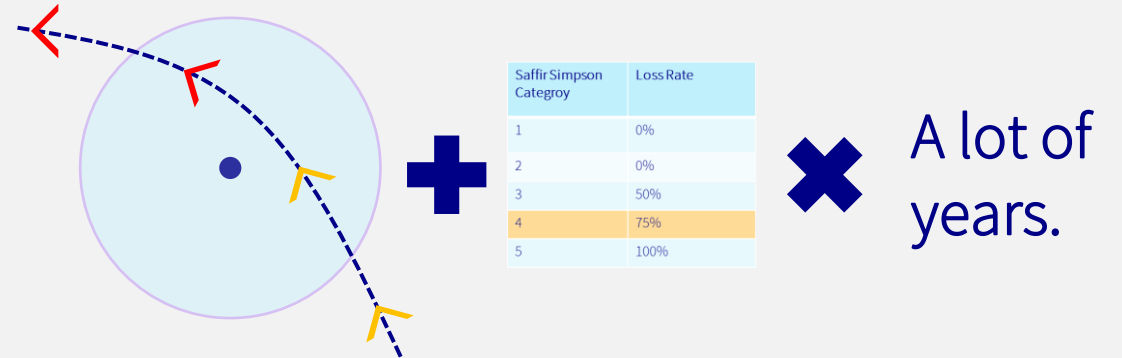
- Two circles around our location – why?
- We have tracks for all historical hurricanes intersecting our location's buffer circles



- For every historical track we can calculate the as-if loss
- The burning cost is the average loss over our observation period

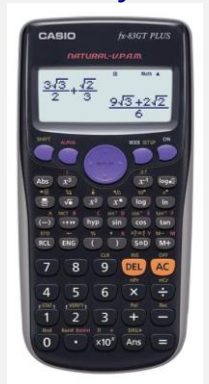
Saffir Simpson Category	Loss Rate
1	0%
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Stochastic Modelling / Expected Loss



Easy.

- At Axa Climate we deploy our proprietary North Atlantic hurricane model
- 20,000 year stochastic catalogue
- Better estimation of volatility and tail
- Both Burning cost and expected loss remain vital to the underwriting process



Real Example: The FSEC Parametric Earthquake Cover

Protecting Morocco's most vulnerable communities against earthquakes – a more complex case

The parametric trigger

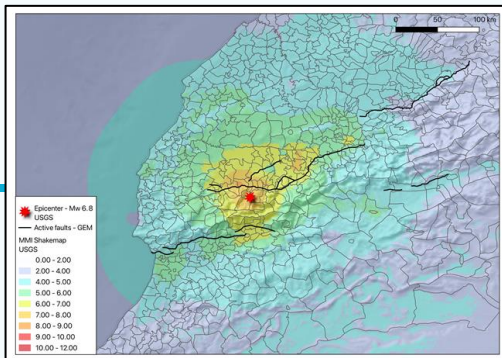
- A minimum moment magnitude of 4.5 (USGS)
- A minimum MMI of 5.0 in any Moroccan commune (USGS ShakeMap)

Parametric loss calculation

- The modelled loss rates are used to calculate a financial loss for each commune, before calculating a country aggregate loss

1 Maximum MMI per Commune

Maximum MMI is derived for each Commune, from the USGS ShakeMap product



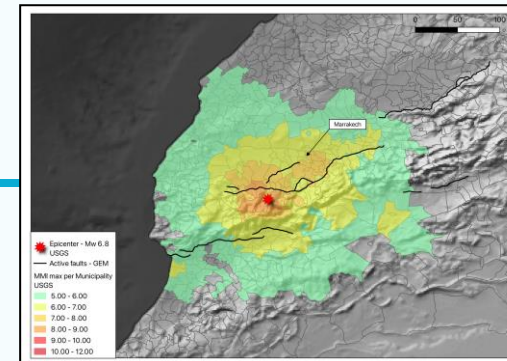
2 Conversion to a loss rate

A loss rate is calculated for each commune based on the maximum MMI

MMI	Loss rate
5 - 5.5	0.0070%
5.5 - 6	0.35%
6 - 6.5	0.98%
6.5 - 7	2.80%
7 - 7.5	7.50%
7.5 - 8	12.50%
8 - 8.5	17.50%
8.5 - 9	22.50%
9 - 9.5	27.50%
9.5 - 10	32.50%
>=10	38.50%

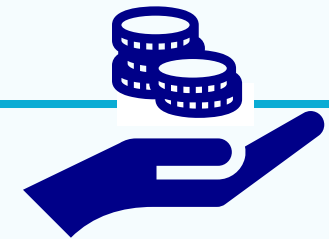
3 Loss per commune

Commune loss =
Commune sum insured *
parametric loss rate



4 Total loss

Total loss is aggregated across Morocco. Final loss is calculated with the application of a deductible



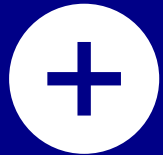
So, What's the Downside? Basis Risk...

Care must be taken to ensure indices and triggers are representative of risk

What is it?

The possibility that the calculated payout (or lack thereof) - **differs** from the actual loss of the insured.

It can be both positive and negative:



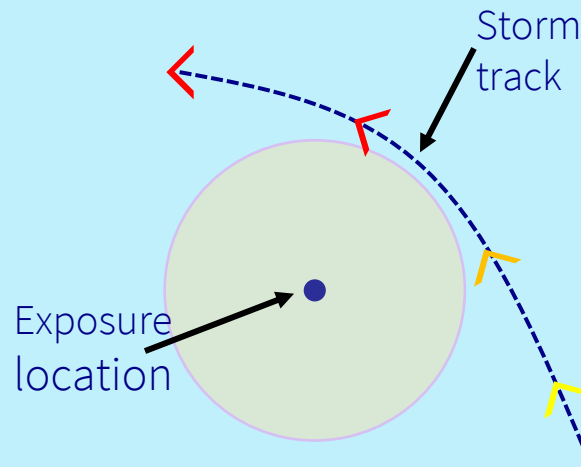
The insured received a higher payout than the actual loss amount



The insured received a lower payout than the actual loss amount

Saffir Simpson Category	Loss Rate
1	0%
2	0%
3	50%
4	75%
5	100%

Remember our Example?



- What if it missed the trigger circle but still caused damage?
- What if a **category 1** storm passed through the circle and still caused damage?
- **Loss statements** – we can't forget loss statements...

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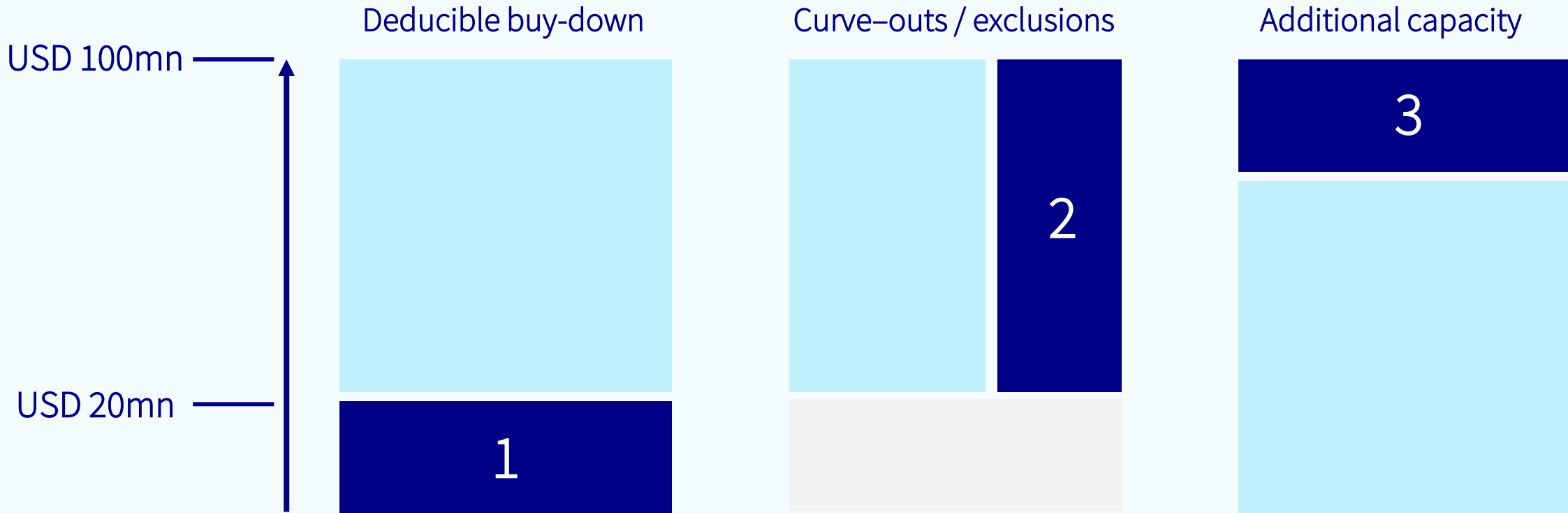
**How is
Parametric
Insurance
Being Used?**



Parametric Insurance can Fill the Gap(s)



We generally use parametric insurance to fill gaps, not the entire insured value



Some gaps have always existed, some are new. Markets such as the US SCS market are stressed. The result is higher deductibles, lower limits and more exclusions. Parametric can help.

Sovereign Risk Transfer - Parametric is an Indispensable Tool

For sovereigns, exposure is hard to define and rapid payouts are vital for disaster relief

Why Parametric?

- Exposures can sometimes be difficult to define – prerequisite for a traditional cover
- A serious estimate of a claim amount would take years (if at all possible)
- Rapid access to liquidity can be vital for disaster relief and resilience building
- Some countries are utilising parametric risk transfer through cat bonds (e.g. Jamaica, Mexico)
- The control of basis risk is key, but challenging



Agriculture - One of the Biggest Markets

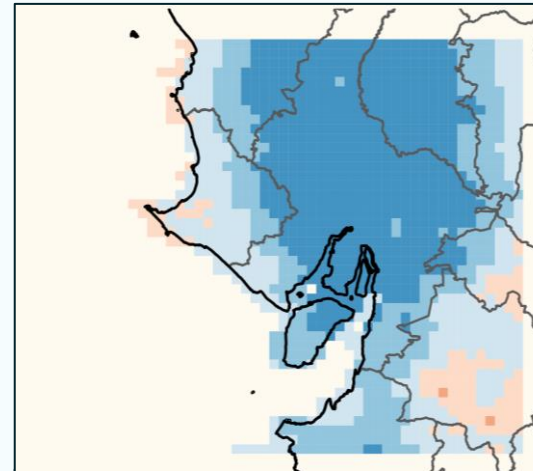
The agriculture market is one of the most mature segments

Why Parametric?

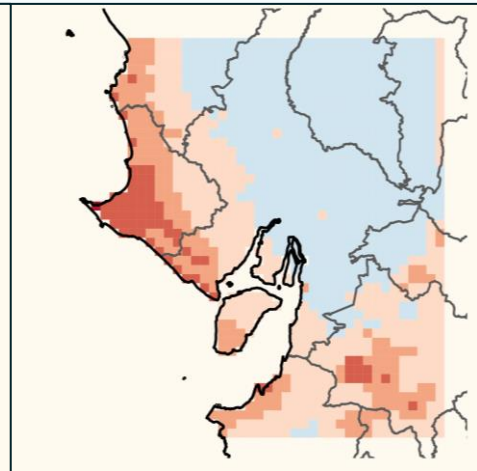
- Agriculture is highly correlated to weather perils
- Drought, excess precipitation, temperature, wind...
- Small hold farmers have not always been able to **access traditional insurance** products (scale)
- Aggregators still required for efficiency
- **Simplicity is key** for these products (small limits / premiums)

We often use gridded data products for agriculture – see below the [CHIRPS precipitation](#) data for Ecuador. Used for structuring excess precipitation cover.

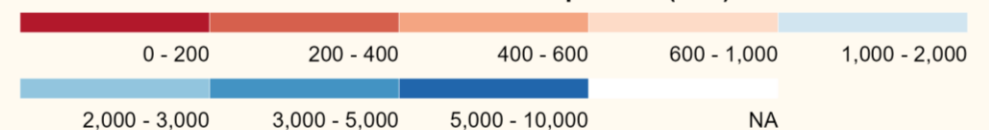
1998 cumulative precipitation



40-year average annual cumulative precipitation



Cumulative Annual Precipitation (mm)



03

**The Parametric
Insurance
Market**



The Market - Who's Playing?

Many of the usual suspects that we've all come to know well

Carriers

There are pure parametric carriers. Most belong to traditional carriers, however.

Buyers

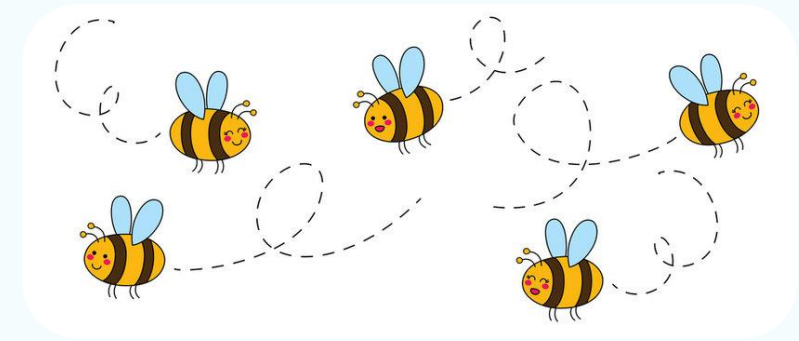
Highly diverse range of buyers, from farmers to sovereign risk funds.

Third Parties

Many new players in this space. Designing new products and reaching new buyers.

Brokers

Some parametric focused brokers but many key teams are within the existing broking shops.



Everyone is working hard.

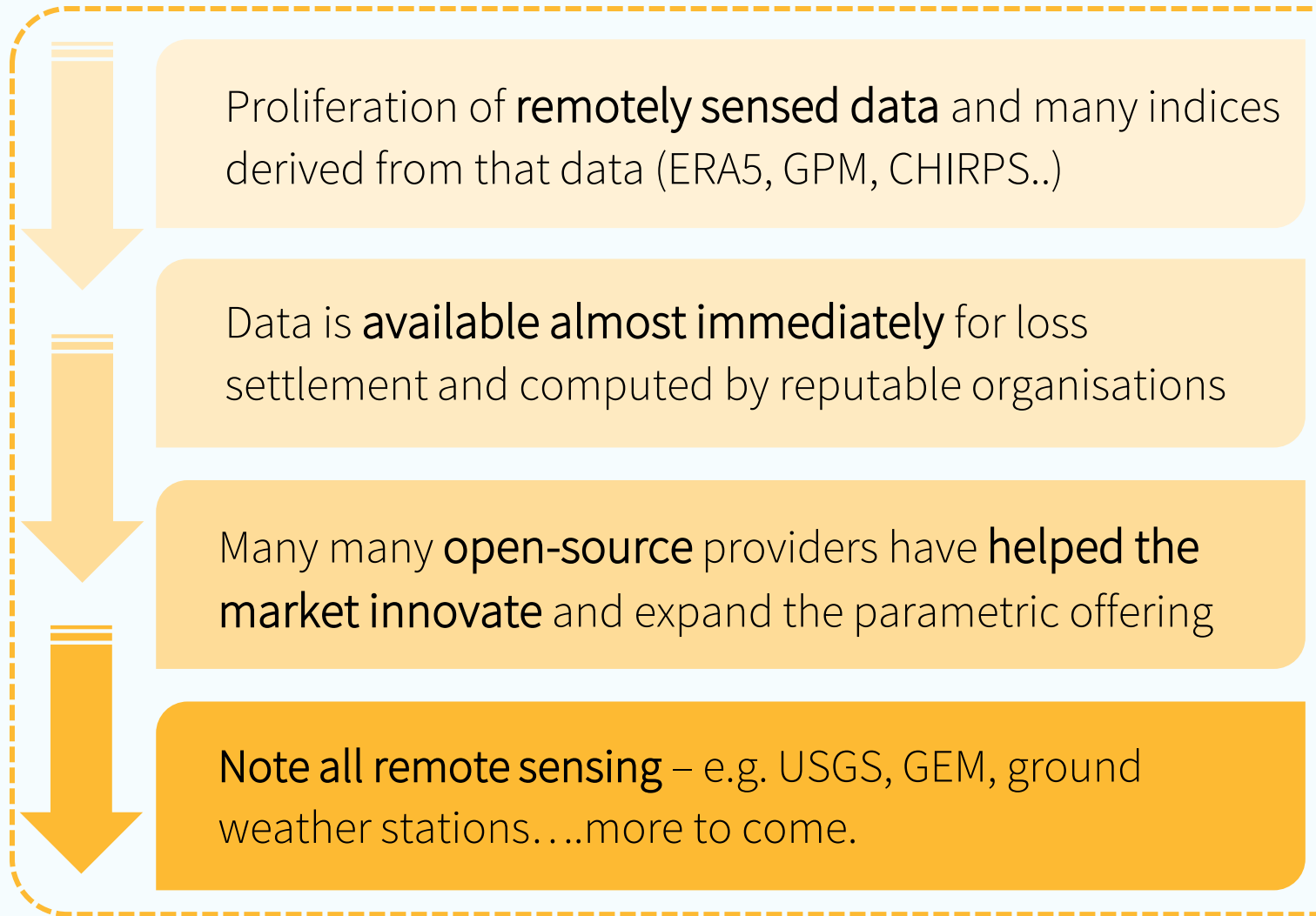
- Every player is contributing to the **growth and innovation** of our product.
- Products are being **tailored to local needs** (perils, crops, commercial setting, climatology et..).
- Many carriers are the **usual suspects** – how does this play out in **stressed markets**?
- Where does the **data come from?** – public sector has been key here.

The Data Revolution

Growth in the parametric market is gone hand in hand with the proliferation of open source remotely sensed data



FLOODBASE



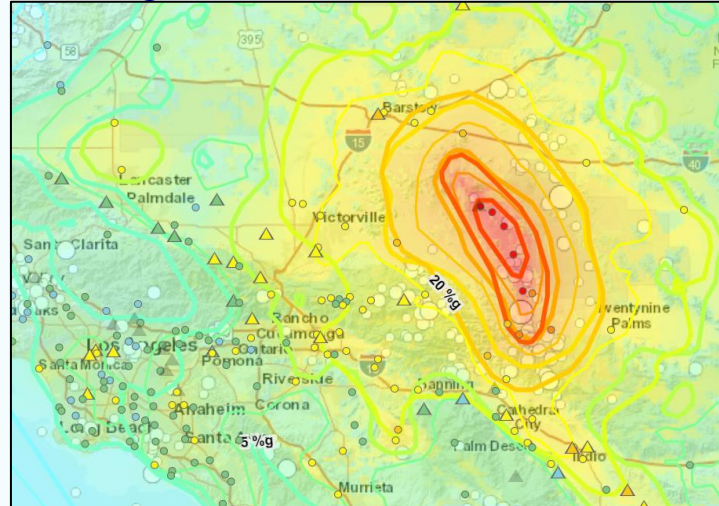
The Data Revolution - Less Remote Sensing?

There is more data becoming available – measuring instruments becoming popular

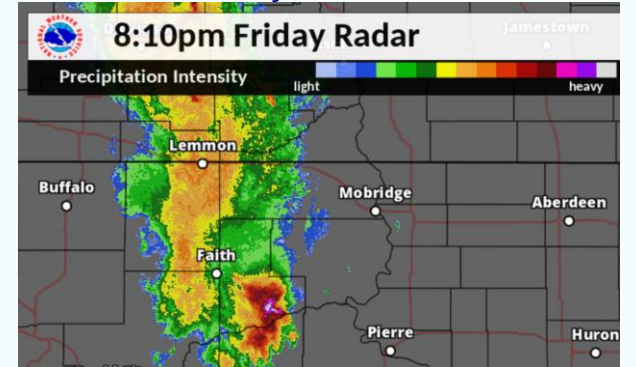
Why use sensors?

- We discussed **basis risk** already – flood and earthquake offer good case studies.
- There remains **considerable uncertainty for some perils.**
- Issue can be solved by installing measuring instruments.
- Must be simple and relatively inexpensive.
- Mostly applicable for single high value sites.

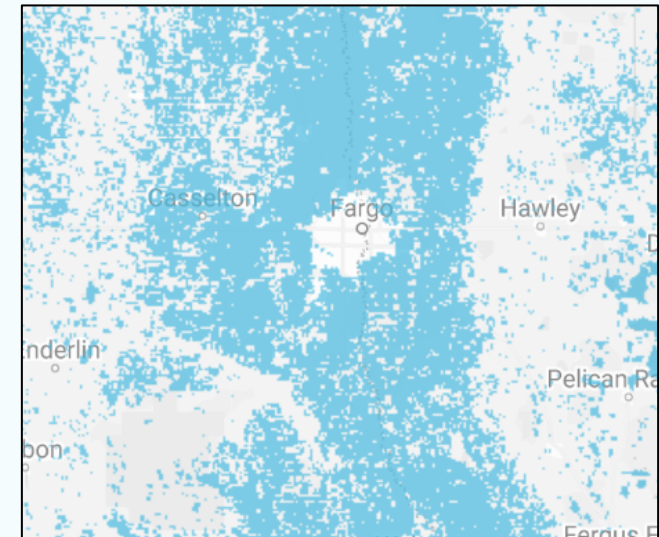
USGS ShakeMap Product (modelled + ground observation + DYFI).



Severe convective Storm recorded by radar



Flood map from satellite derived observations



Ground based sensors could be more accurate for a parametric trigger.

What Next for the Parametric Market?

New products and solutions are always appearing on the market

The protection gap

- It remains significant. Parametric (re)insurance has already proved successful at protecting the uninsured (FSEC, ARC...)
- Expect more but expect scrutiny, too

Reinsurance

- A lot of facultative already, supporting smaller, local insurer's, programs
- We've seen an increase in US carriers looking for parametric 'carve-out' reinsurance (Hail, tornado...)

Parametric guarantees

- There are travel guarantees (flight delays, bad weather etc.) and crop emergence guarantees
- Many more potential products here

New perils

- Some Perils, such as flood, remain difficult to capture accurately
- This is changing quickly, and we expect more products

New participants

- More parametric focused brokers, MGAs, data providers and buyers (hopefully)
- Lots of people want to get in on this market as it grows

Seagulls...?

- Fish and chip shops in Scotland are rumoured to be selling £1 insurance in case a seagull steals your food (entirely possible)
- Anyone help them to understand their tail risk? Any capital providers?



Climate change. It's Already Here.

It is constant consideration for every weather-based product

Insurability of certain perils/regions ?

- Wildfires Canada
- Droughts Europe
- Hail France/Italy

Pricing considerations:

- How to account for Climate Change ? How accurate are forecasts ?
- Until which point does it make sense for an asset to be insured ?

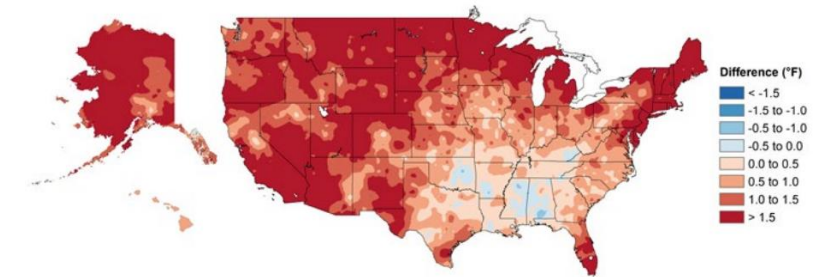
Mitigating the risk

- Low-claim bonus
- Investment in risk mitigation tools
- Engagement of the insurance industry as a whole

Market considerations :

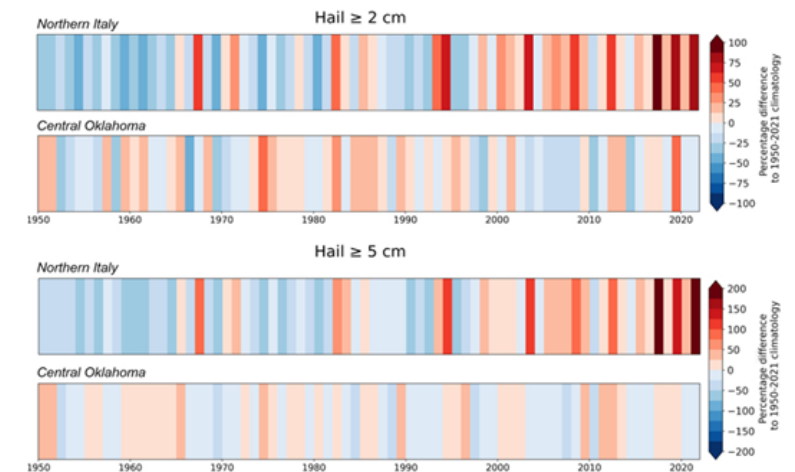
- Necessity of price increases vs price pressure because of aggressive market players in a growth context

Annual temperature change in the US (1986 – 2016 w.r.t 1925 – 1960). Data from nClimDiv.



Source: [NASA](#)

Changes in hail size – climate change and SCS is complex...



Thank you!

Questions are welcome.



Vincent Maarek
Head of Pricing, Axa Climate

+33 6 67 11 68 31

vincent.maarek@axaclimate.com



Toby Sansom
Parametric Underwriter, Axa Climate

toby.sansom@axaclimate.com