Underwriting U.S. Flood

RMS U.S. Inland Flood HD Model Fights the Tides of Adverse Selection

KEY FEATURES AND BENEFITS

- Instant underwriting insight to leverage the world's best model science
- Thousands of vulnerability profiles to calculate damage with unprecedented granularity
- Features to account for important variables such as defenses, basements, and first-floor heights
- Optimized for speed to support fully automated uses
- API data drawn from 50,000-year flood simulation underlying the U.S. Flood HD Model
- High-resolution loss metrics drawing from a domain of more than nine billion grid cells

U.S. flood insurance is predicted to be one of the biggest private market underwriting opportunities of the next decade – and potentially the most challenging.

Nearly all of the coverage for this peril is written by the National Flood Insurance Program (NFIP), a government pool with US$4 billion in annual premiums, five million policies in force, and US$30 billion in accrued debt. Political inertia has prevented structural reforms to the NFIP, although the private market has recently taken a greater role by assuming flood risk through reinsurance channels. Primary insurers are also keen to participate in the flood market, either by complimenting the NFIP's offerings or by competing with them. But growing a successful flood portfolio involves confronting several difficult issues, including persistent adverse selection and inadequate rates on the highest-risk locations.

Recent developments will help the industry solve these once-intractable problems, including an explosion of insurance analytics bringing new tools to quantify flood risk, advances in computing power to deliver analytics at higher resolution, improved exposure data quality, data-sharing efforts by the NFIP, and the anticipation of higher flood insurance take-up rates driven by better risk awareness. This will create opportunities for the private market to write what was once considered largely uninsurable risk.

Flood Is the Quintessential Big Data Challenge

In the U.S., river-based surface flooding from the Mississippi-Missouri basin can affect the majority of the country (not to mention a heavy concentration of insured exposure). The 50,000-year simulation that underlies the RMS® U.S. Inland Flood HD Model draws on a domain of more than nine billion grid cells to calculate loss at high resolution. Add to this the 8,800 vulnerability profiles that robustly calculate damage; modeling options accounting for defenses, basements, and first-floor heights; and the ability to consider correlation between subperils within the same event. Individual portfolio analyses can involve trillions of individual calculations.

Designed for the big data needs of modeling high-gradient perils, the RMS(one)® platform is purpose-built to handle the challenges of quantifying flood risk. The platform's cloud-based architecture enables high-definition modeling to precisely capture the spatial complexity and temporal evolution of a flood catastrophe at unprecedented levels of granularity.

RMS U.S. FLOOD MODELING SOLUTIONS

U.S. flood is a high-gradient, intricate peril incorporating various sources and causing a variety of effects. It requires sophisticated models, data science, and analytics technology to properly understand and assess each risk.

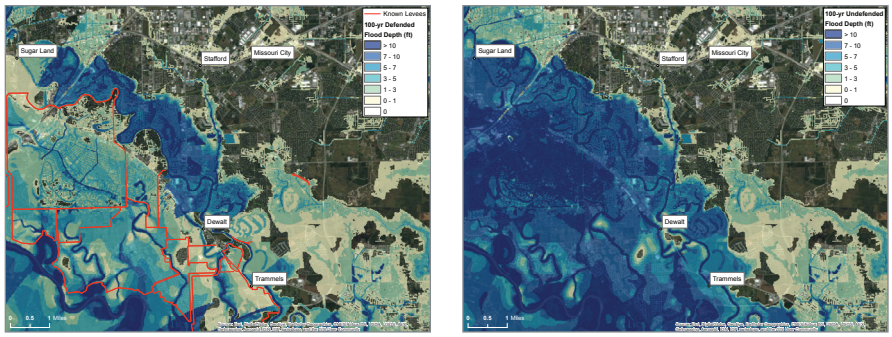
U.S. FLOOD SOURCES & POTENTIAL IMPACTS

FLUVIAL/ RIVERINE	Excessive rainfall/snowmelt over an **extended period of time** causes a **river** to exceed its capacity and overtop its banks
BACKWATER	**Upstream flooding** caused by **downstream conditions**, such as channel restriction and/or high flow at a confluence of streams
COASTAL/ STORM SURGE	**Low-pressure weather systems** over the ocean **elevate sea levels** above the normal tidal limit and flood areas of lower elevation near the coast, often exacerbated by heavy rainfall and onshore winds
GROUNDWATER	**Underground water levels** rise above normal and approach the surface, usually caused by **prolonged periods of rainfall**, which can last for several weeks or months
PLUVIAL/ SURFACE	Overland flow from **rainfall runoff that is not absorbed** or routed for drainage that floods low-lying areas or impermeable urban surfaces
FLASH	**Heavy or excessive rainfall** causes rapid flooding of low-lying areas within minutes or hours (typically **less than six hours**); also possible with a sudden release of water from a levee/dam (failure), ice jam, or other debris

The Known Unknown: Levees, Dams, and Other Defenses

Flood defenses are a critical part of understanding loss outcomes. The U.S. river network carries an estimated 100,000 miles of levee defenses, yet the Federal Emergency Management Agency (FEMA) levee network accounts for less than 20 percent and there is no systematic inventory of the rest. To address this data shortage, RMS developed a proprietary standard-of-protection methodology to assess the likely flood defense capabilities of municipalities and communities based on exposure concentrations, population density, and the degree of flood risk. The resulting "model within a model" enables underwriters to correctly estimate flood risk at lower return periods. It also provides dual views of risk that holistically consider local flood defenses and, more importantly, a worst-case view in the event of failure.

Assessing a risk's susceptibility to flood using a comprehensive set of defense assumptions is useful for an underwriter. For example, the standard RMS protection methodology takes into consideration that the undefended (worst-case) view for two risks in identical flood zones could be benign for one property but catastrophic for the other. Understanding this distinction is key to risk selection.



Modeled 100-year return period flood depths (ft) in defended (left) and undefended (right) scenarios along the Brazos River near suburbs west of Houston, Texas

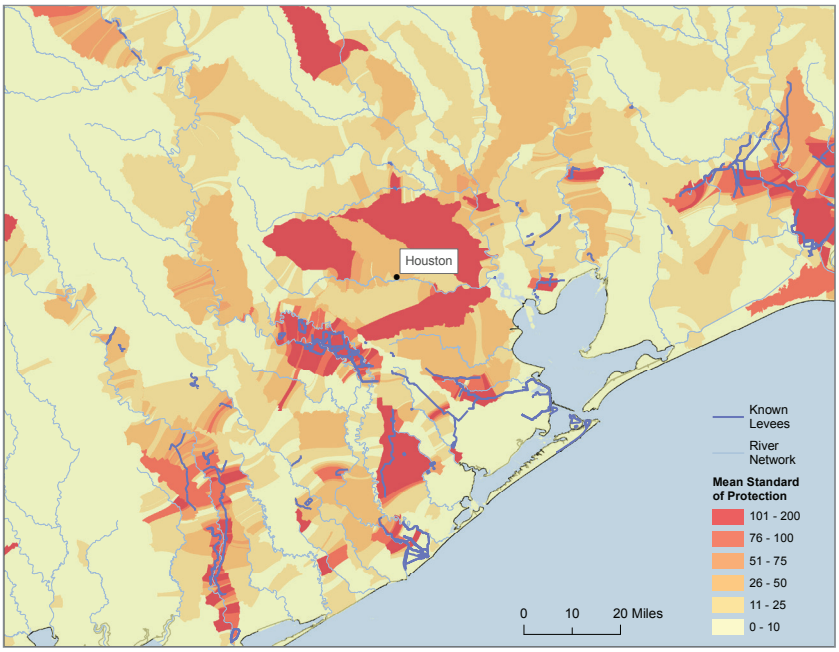
INSIGHT THROUGH RMS API CALLS

- Flood depth
- Flood zone
- Loss cost
- Basement probability
- First-floor height
- Risk score
- Elevation

RMS Models Via API Offer Real-Time Underwriting Decisions

A decade ago, commercial lines underwriting transactions were extended affairs: broker submissions were processed, verified, and priced over the course of several days. Questions were asked, coverages negotiated, and commissions haggled. This process has become increasingly automated thanks to underwriting rules engines (to decline, refer, or quote) and predictive models (to price). However, analytics to drive these real-time decisions must be delivered quickly and efficiently.

To accommodate the speed of today's underwriting, RMS Location Intelligence API delivers high-resolution, pre-compiled loss analytics directly to the underwriting desk. Distilled from terabytes of flood data based on a 50,000-year precipitation simulation, the API's flood data provides the insight necessary to pinpoint properties with less susceptibility to catastrophic flooding. This enables both property attributes that are less vulnerable (without the overhead of full account modeling) and precise metrics to drive risk-based pricing at the point of underwriting.



Known levees from the National Levee Database (blue) and RMS-modeled mean standard of protection of river defenses in southeastern Texas

State-of-the-Art Flood Coverage Capabilities

The U.S. flood insurance landscape is at an inflection point. Take-up rates are on the rise in the aftermath of recent events, and risk awareness is improving. Underlying these trends is a revolution in analytic capabilities. Cloud computing is becoming widely adopted to solve big data problems, modeling is improving in both accuracy and speed, and underwriting is increasingly data-driven. Insurers can seize this opportunity to provide flood coverages that better suit the needs of buyers, deploy capital more confidently with state-of-the-science risk assessment tools, and contribute to more resilient disaster recovery.

Find Out More

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RMS is the world's leading catastrophe risk modeling company. From earthquakes, hurricanes, and flood to terrorism, agriculture, and infectious diseases, RMS helps financial institutions and public agencies understand, quantify, and manage risk.

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